



United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
Iowa Agriculture and
Home Economics
Experiment Station;
Cooperative Extension
Service, Iowa State
University; and Division of
Soil Conservation, Iowa
Department of Agriculture
and Land Stewardship

Soil Survey of Jefferson County, Iowa

Part I



How to Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, the survey area is divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** in Part I of this survey for a general description of the soils in your area.

The **detailed soil maps** can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet, and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** in Part I of this survey, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** in Part II shows which table has data on a specific land use for each detailed soil map unit. See the **Contents** in Part I and Part II for other sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1992. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1992. This survey was made cooperatively by the Natural Resources Conservation Service; the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship. The survey is part of the technical assistance furnished to the Jefferson County Soil and Water Conservation District. Funds appropriated by Jefferson County were used to defray part of the cost of the survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Cover: Contour farming, erosion-control structures, and terraces are common conservation practices in Jefferson County.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is <http://www.nrcs.usda.gov> (click on "Technical Resources").

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Foreword

This soil survey contains information that can be used in land-planning programs in Jefferson County, Iowa. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

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Soil Survey of Jefferson County, Iowa

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with Iowa Agriculture and Home Economics Experiment Station; Cooperative Extension Service, Iowa State University; and Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, soil scientists develop a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientists to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size, and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, soil reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

This soil survey updates the survey of Jefferson County published in 1960 (Smith and Riecken, 1960). It provides additional information and has larger maps, which show the soils in greater detail.

The descriptions, names, and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of a better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey areas.

General Nature of the Survey Area

Jefferson County is in southeastern Iowa (fig. 1). It is bounded on the north by Washington and Keokuk Counties, on the east by Henry County, on the south by Van Buren County, and on the west by Wapello County.

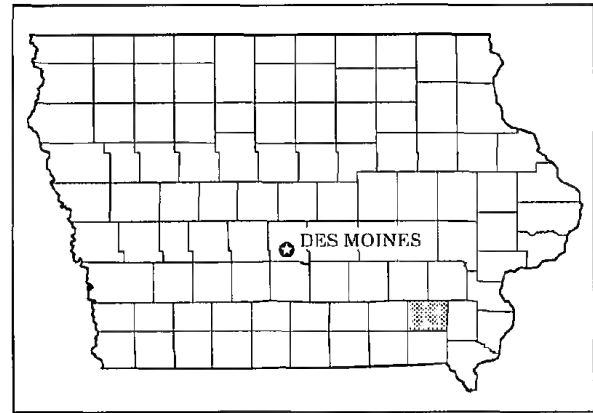


Figure 1.—Location of Jefferson County in Iowa.

History and Development

The area now known as Jefferson County was acquired from France by the United States as a part of the Louisiana Purchase in 1803. The Louisiana Purchase took place during the administration of Thomas Jefferson, the third President of the United States and the namesake of the county (Welty, 1968).

In 1804, the survey area became part of the District of Louisiana, which for administrative purposes was attached to the Territory of Indiana. In 1805, the area became part of the Territory of Louisiana. When the State of Louisiana was admitted into the Union in 1812, the area became part of the Territory of Missouri. When Missouri was admitted into the Union in 1821, the area that is now Jefferson County was part of a territory that received no attention and was left without any form of government for 13 years. It was considered part of the unorganized territory of the United States until 1834. In September 1834, the area became part of the Michigan Territory. It was part of Des Moines County, Michigan. In April 1836, the area became part of the Wisconsin Territory. It was made part of Henry County, Wisconsin, in October 1836. In 1838, the area became part of the Territory of Iowa. Jefferson County, Iowa, was established in March of 1839 (Western Historical Company, 1879).

At the time of the purchase from France, the survey area was inhabited by many Indian tribes and a few white fur trappers and traders. The settlement of the area was precipitated by the Blackhawk Purchase in 1832, by which Indian lands were ceded following the Blackhawk Wars. On June 1, 1833, the territory of the Blackhawk Purchase was legally opened for white settlement (Western Historical

Company, 1879). The population of Jefferson County grew rapidly from the early settlement until 1870. At that time the population was 17,839. It has remained relatively constant since then. In 1980, the population of Jefferson County was 16,316 (U.S. Department of Commerce, 1980).

Fairfield, the county seat of Jefferson County, is noted for having hosted the first Iowa State Fair, which took place October 25 to 27, 1854 (Western Historical Company, 1879). Fairfield is now the home of the Maharishi International University.

On August 16, 1941, the Jefferson County Soil Conservation District was formed. The first elected commissioners were Roy J. Lamansky, Elmer Davis, and Grant Nelson.

Agriculture is the chief economic enterprise in Jefferson County. It provides a livelihood for farmers as well as those engaged in business, finance, and many related agribusiness activities. Most of the local income is from the sale of livestock and grain.

The most extensively raised livestock in Jefferson County are beef cattle, hogs, and sheep. In 1989, 5,800 head of grain-fed cattle, 133,000 head of market hogs, and 2,800 head of grain-fed lambs were marketed (Skow and Holden, 1990).

Crop production in the county consists of 75,000 acres of corn, 59,800 acres of soybeans, 8,800 acres of oats, 24,600 acres of hay, and 3,000 acres of wheat (Skow and Holden, 1990). The production from these crops is used in livestock rations or sold on the cash grain market.

Farms in Jefferson County have been declining in number and increasing in size. In 1989, the county had 780 farms that covered 262,300 acres. The average farm size is 336 acres (Skow and Holden, 1990).

Transportation Facilities

Two major highways serve Jefferson County. U.S. Highway 34 crosses the county mainly from east to west, and State Highway 1 crosses from north to south. These two highways intersect at Fairfield. Hard-surface county roads connect these highways to all of the smaller communities in the county. All farms and rural residences have access to roads of gravel or crushed limestone. Major county roads are well distributed throughout the county.

Two railroad freight lines pass through Jefferson County. One crosses the extreme northwest corner of the county, and the other crosses through the central part of the county in an east-west direction, passing through Batavia, Fairfield, and Lockridge. Bus service and an airport are available at Fairfield. Motor

freight lines service every trading center in the county.

Physiography and Drainage

The highest point of elevation in Jefferson County is approximately 820 feet above sea level. It is located approximately one-fourth mile southeast of Pekin in the far northwest corner of the county. The lowest point of elevation is approximately 580 feet above sea level. It is located at the point where the Skunk River leaves Jefferson County on the eastern edge of the county.

The difference in elevation between the lowlands and adjoining uplands ranges from 140 to 160 feet along the Skunk River and its tributaries in eastern Jefferson County. It ranges from 60 to 120 feet in the western part of the county. Surface elevations gradually increase in an east-west direction across the county.

The relief along the Skunk River, Cedar Creek, Stump Creek, and Lick Creek is characterized by moderately steep and steep slopes rising from the lowlands. The relief near the remaining drainage systems, which are smaller, is characterized by moderately sloping and strongly sloping slopes rising from the lowlands.

The Skunk River and its tributaries drain about 93 percent of Jefferson County. The Des Moines River and its tributaries drain the southwestern part of the county. The drainage area of the Des Moines River and its tributaries is about 7 percent of the county.

Burr Oak Creek, Walnut Creek, Rocky Branch Creek, Turkey Creek, Brush Creek, and Wolf Creek flow eastward into the Skunk River. These tributaries drain about 47 percent of the county.

Cedar Creek and its tributaries flow southeastward into the Skunk River. They drain about 46 percent of the county.

Climate

The three tables at the end of this section give climate data for the survey area as recorded at Fairfield, Iowa, in the period 1961 to 1990.

In winter, the average temperature is 24.6 degrees F and the average daily minimum temperature is 15.7 degrees. The lowest temperature on record, which occurred at Fairfield on January 22, 1930, is -29 degrees. In summer, the average temperature is 74.0 degrees and the average daily maximum temperature is 85.3 degrees. The highest temperature, which occurred at Fairfield on July 15, 1936, is 114 degrees.

Growing degree days are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 36.01 inches. Of this, about 24.48 inches, or 68 percent, usually falls in April through September. The growing season for most crops falls within this period. The heaviest 1-day rainfall on record was 4.87 inches at Fairfield on June 13, 1946. Thunderstorms occur on about 49 days each year, and most occur in June.

The average seasonal snowfall is 28.7 inches. The greatest snow depth at any one time during the period of record was 26 inches on February 8, 1979. On an average, 39 days per year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 14 inches on January 3, 1971.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 79 percent. The sun shines 70 percent of the time possible in summer and 51 percent in winter. The prevailing wind is from the northwest. Average windspeed is highest, 12.9 miles per hour, in March and April.

Temperature and Precipitation
(Recorded in the period 1961-90 at Fairfield, Iowa)

	Temperature						Precipitation				
Month				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	30.3	12.1	21.2	59	-18	0	1.12	0.41	1.71	2	7.3
February-----	35.6	17.0	26.3	64	-13	1	.97	.50	1.38	3	7.2
March-----	48.4	28.5	38.5	80	2	32	2.48	1.18	3.60	5	4.0
April-----	63.1	40.5	51.8	88	19	148	3.35	1.91	4.63	6	1.3
May-----	74.3	51.2	62.8	92	33	395	4.01	2.48	5.39	7	.0
June-----	83.6	60.5	72.1	97	45	659	3.56	1.85	5.06	6	.0
July-----	87.6	65.1	76.3	101	49	812	5.17	2.21	7.68	7	.0
August-----	84.7	62.2	73.5	100	47	725	4.12	2.11	5.88	6	.0
September---	76.6	54.4	65.5	94	34	468	4.27	1.78	6.38	6	.0
October-----	65.1	43.2	54.2	87	23	191	3.02	1.00	4.69	5	.1
November----	49.3	31.3	40.3	73	7	30	2.18	.73	3.36	4	1.8
December----	34.6	18.0	26.3	63	-13	2	1.76	.71	2.65	4	7.0
Yearly:											
Average---	61.1	40.3	50.7	---	---	---	---	---	---	---	---
Extreme---	---	---	---	102	-20	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,463	36.01	29.32	42.04	61	28.7

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Fairfield, Iowa)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 13	Apr. 22	May 3
2 years in 10 later than--	Apr. 8	Apr. 18	Apr. 9
5 years in 10 later than--	Mar. 31	Apr. 9	Apr. 20
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 22	Oct. 11	Sept. 27
2 years in 10 earlier than--	Oct. 27	Oct. 16	Oct. 2
5 years in 10 earlier than--	Nov. 4	Oct. 25	Oct. 12

Growing Season

(Recorded in the period 1961-90 at Fairfield,
Iowa)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	<u>Days</u>	<u>Days</u>	<u>Days</u>
9 years in 10	201	178	155
8 years in 10	206	185	162
5 years in 10	217	198	174
2 years in 10	228	211	186
1 year in 10	234	217	193

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

1. Taintor-Mahaska-Otley Association

Setting

Landform: Uplands

Slope range: 0 to 9 percent

Composition

Percent of survey area: 13

Extent of components in the association (fig. 2):

Taintor and similar soils—40 percent

Mahaska and similar soils—24 percent

Otley and similar soils—8 percent

Soils of minor extent—28 percent

Soil Properties and Qualities

Taintor

Drainage class: Poorly drained

Landform: Upland flats

Geomorphic component: Divides

Hillslope position: Summits

Slope: 0 to 2 percent

Parent material: Loess

Mahaska

Drainage class: Somewhat poorly drained

Landform: Uplands

Geomorphic component: Divides, interfluves, head slopes, nose slopes, and side slopes

Hillslope position: Summits and shoulders

Slope: 0 to 5 percent

Parent material: Loess

Otley

Drainage class: Moderately well drained

Landform: Uplands

Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes

Hillslope position: Shoulders, summits, and backslopes

Slope: 2 to 9 percent

Parent material: Loess

Minor Soils

- Kalona and similar soils
- Nira and similar soils
- Clarinda and similar soils
- Shelby and similar soils
- Sperry and similar soils
- Olmitz and similar soils

2. Mahaska-Otley-Nira Association

Setting

Landform: Uplands

Slope range: 0 to 9 percent

Composition

Percent of survey area: 13

Extent of components in the association:

Mahaska and similar soils—31 percent

Otley and similar soils—25 percent

Nira and similar soils—16 percent

Soils of minor extent—28 percent

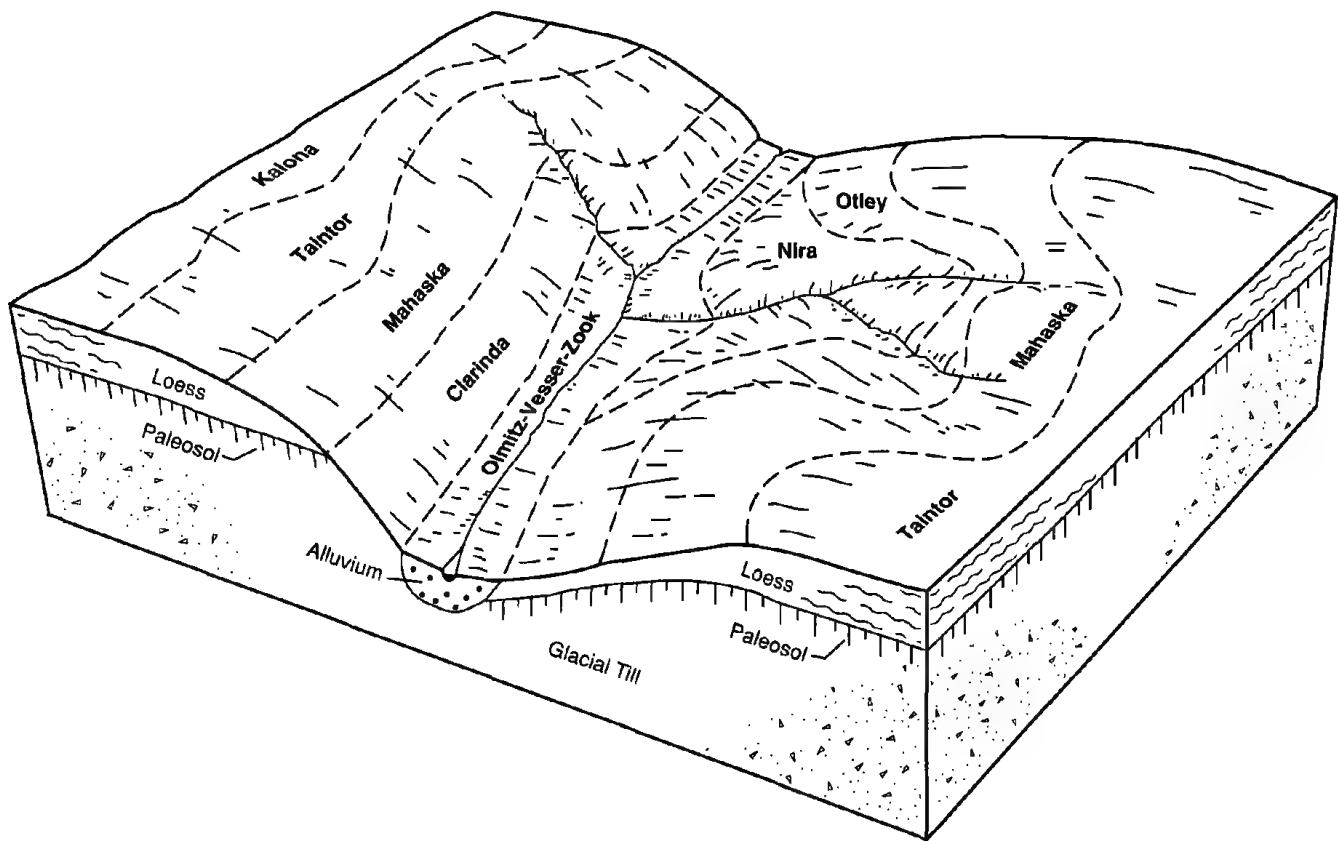


Figure 2.—Typical pattern of soils and parent material in the Taintor-Mahaska-Otley association.

Soil Properties and Qualities

Mahaska

Drainage class: Somewhat poorly drained
Landform: Uplands
Geomorphic component: Divides, interfluvies, head slopes, nose slopes, and side slopes
Hillslope position: Summits and shoulders
Slope: 0 to 5 percent
Parent material: Loess

Otley

Drainage class: Moderately well drained
Landform: Uplands
Geomorphic component: Interfluvies, head slopes, nose slopes, and side slopes
Hillslope position: Shoulders, summits, and backslopes
Slope: 2 to 9 percent
Parent material: Loess

Nira

Drainage class: Moderately well drained

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Shoulders and backslopes

Slope: 5 to 9 percent

Parent material: Loess

Minor Soils

- Clarinda and similar soils
- Shelby and similar soils
- Gara and similar soils
- Lamon and similar soils
- Olmitz and similar soils

3. Ladoga-Hedrick-Gara Association

Setting

Landform: Uplands

Slope range: 2 to 18 percent

Composition

Percent of survey area: 16

Extent of components in the association (fig. 3):

Ladoga and similar soils—26 percent
 Hedrick and similar soils—13 percent
 Gara and similar soils—13 percent
 Soils of minor extent—48 percent

Soil Properties and Qualities**Ladoga**

Drainage class: Moderately well drained
Landform: Uplands
Geomorphic component: Interfluvies, nose slopes, head slopes, and side slopes
Hillslope position: Shoulders, summits, and backslopes
Slope: 2 to 9 percent
Parent material: Loess

Hedrick

Drainage class: Moderately well drained
Landform: Uplands
Geomorphic component: Nose slopes, head slopes, and side slopes
Hillslope position: Shoulders and backslopes
Slope: 5 to 14 percent

Parent material: Loess

Gara

Drainage class: Well drained
Landform: Uplands
Geomorphic component: Nose slopes, head slopes, and side slopes
Hillslope position: Backslopes
Slope: 9 to 18 percent
Parent material: Glacial till

Minor Soils

- Rinda and similar soils
- Bucknell and similar soils
- Lindley and similar soils
- Olmitz and similar soils
- Givin and similar soils

4. Clinton-Lindley-Ashgrove Association**Setting**

Landform: Uplands
Slope range: 2 to 40 percent

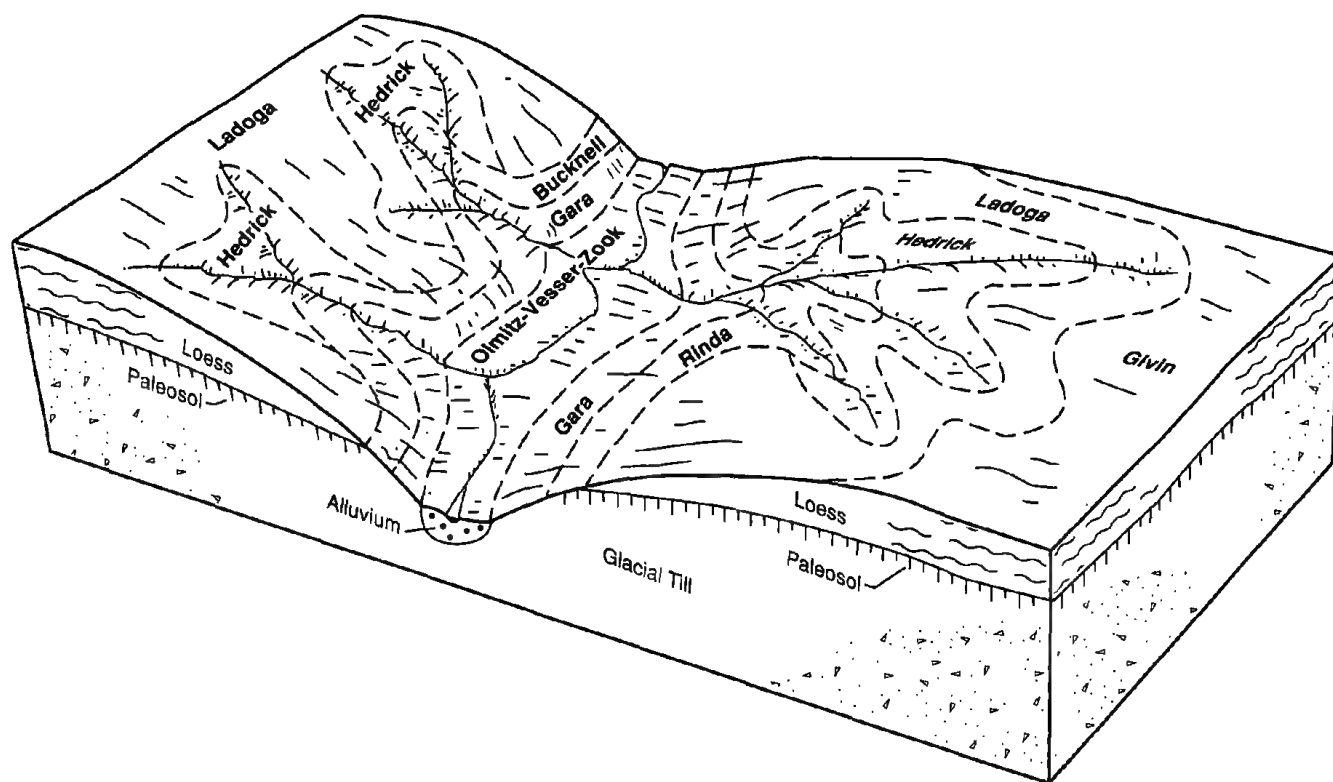


Figure 3.—Typical pattern of soils and parent material in the Ladoga-Hedrick-Gara association.

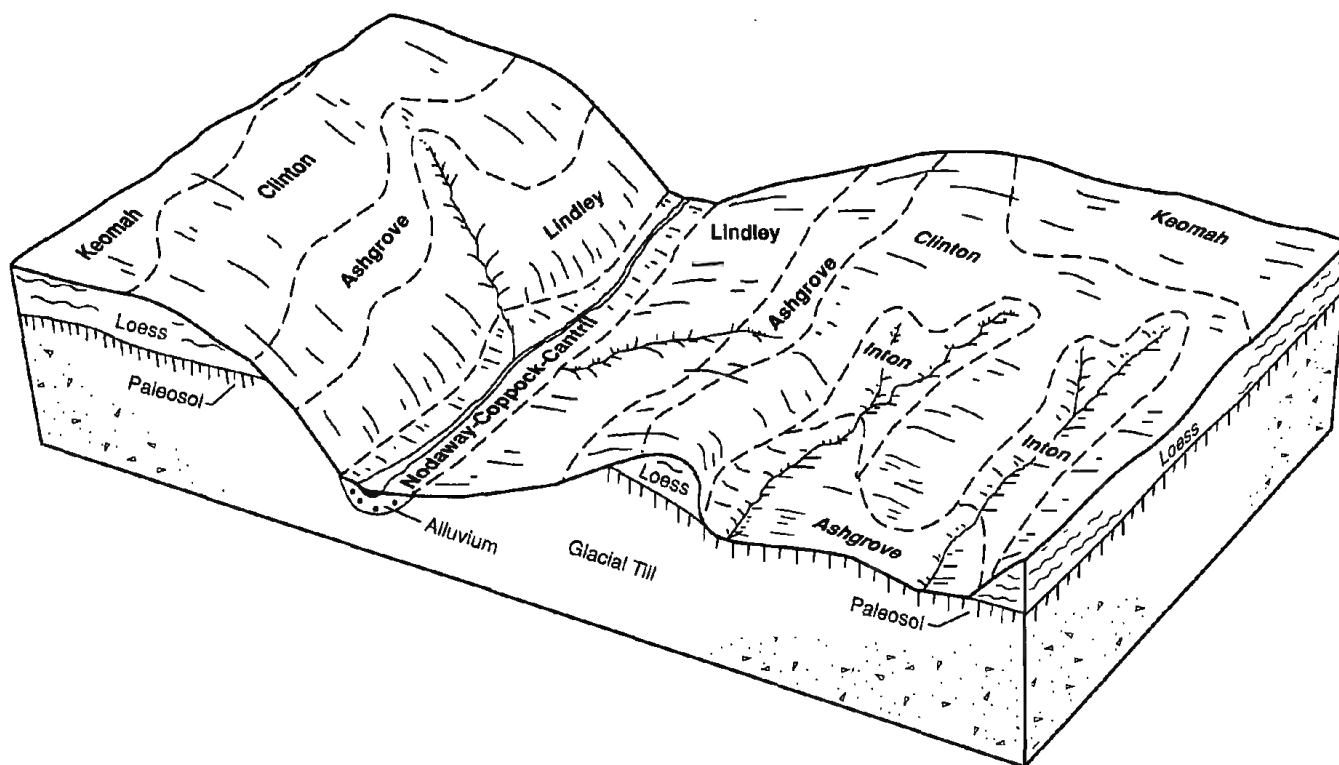


Figure 4.—Typical pattern of soils and parent material in the Clinton-Lindley-Ashgrove association.

Composition

Percent of survey area: 12

Extent of components in the association (fig. 4):

Clinton and similar soils—49 percent

Lindley and similar soils—21 percent

Ashgrove and similar soils—12 percent

Soils of minor extent—18 percent

Soil Properties and Qualities

Clinton

Drainage class: Moderately well drained

Landform: Uplands and stream terraces

Geomorphic component: Interfluves, nose slopes, head slopes, and side slopes

Hillslope position: Summits, shoulders, and backslopes

Slope: 2 to 14 percent

Parent material: Loess

Lindley

Drainage class: Well drained

Landform: Uplands

Geomorphic component: Nose slopes, head slopes, and side slopes

Hillslope position: Backslopes

Slope: 9 to 40 percent

Parent material: Glacial till

Ashgrove

Drainage class: Poorly drained

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes and shoulders

Slope: 5 to 14 percent

Parent material: Loess over gray paleosol weathered from glacial till

Minor Soils

- Keswick and similar soils
- Inton and similar soils
- Nodaway and similar soils
- Keomah and similar soils

5. Haig-Grundy-Clarinda Association

Setting

Landform: Uplands

Slope range: 0 to 9 percent

Composition

Percent of survey area: 12

Extent of components in the association (fig. 5):

Haig and similar soils—46 percent

Grundy and similar soils—30 percent

Clarinda and similar soils—14 percent

Soils of minor extent—10 percent

Soil Properties and Qualities

Haig

Drainage class: Poorly drained

Landform: Upland flats

Geomorphic component: Divides

Hillslope position: Summits

Slope: 0 to 2 percent

Parent material: Loess

Grundy

Drainage class: Somewhat poorly drained

Landform: Uplands

Geomorphic component: Interfluvies, head slopes, nose slopes, and side slopes

Hillslope position: Summits and shoulders

Slope: 2 to 5 percent

Parent material: Loess

Clarinda

Drainage class: Poorly drained

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 5 to 9 percent

Parent material: Loess over gray paleosol weathered from glacial till

Minor Soils

- Arispe and similar soils
- Rinda and similar soils
- Pershing and similar soils

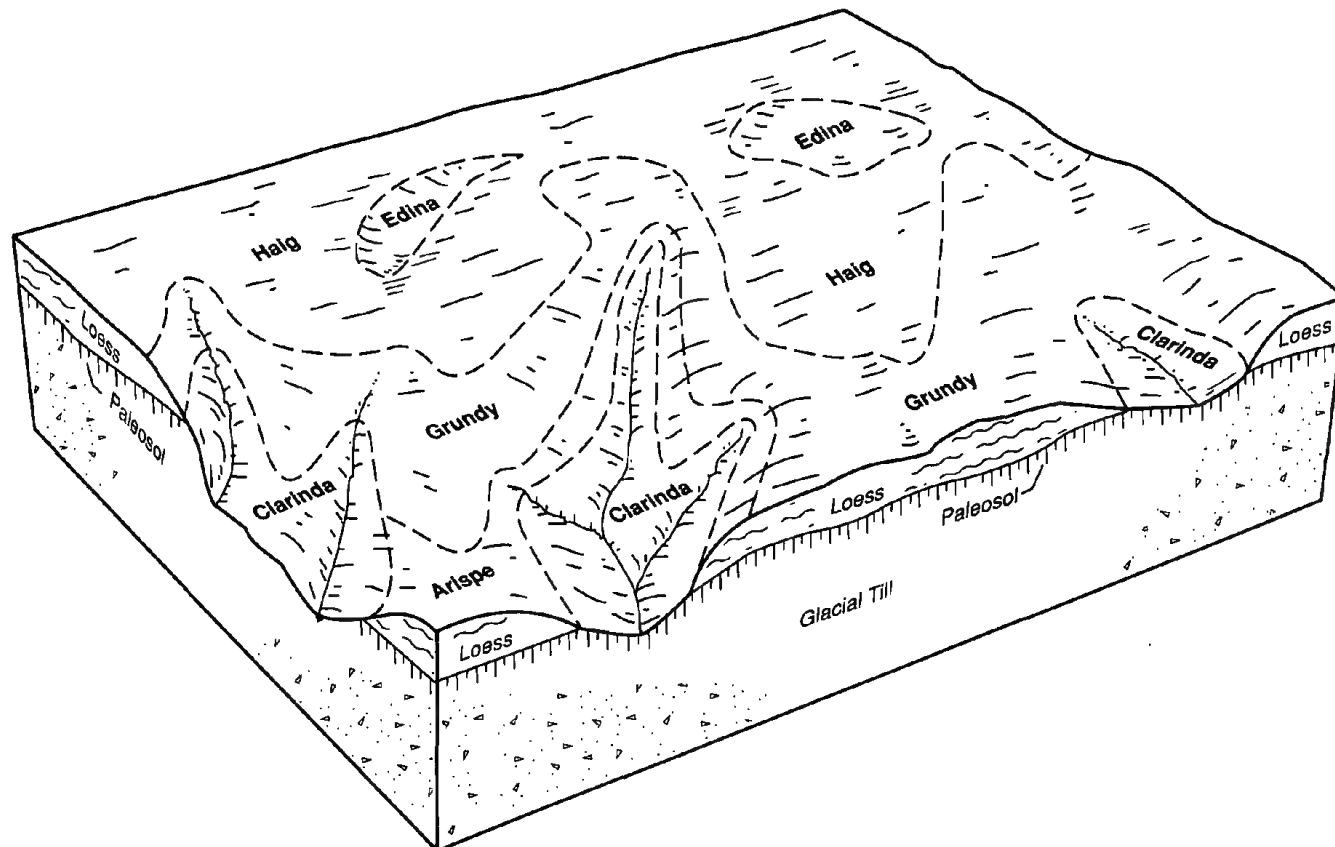


Figure 5.—Typical pattern of soils and parent material in the Haig-Grundy-Clarinda association.

- Olmitz and similar soils
- Edina and similar soils

6. Pershing-Lindley-Rinda Association

Setting

Landform: Uplands
Slope range: 2 to 18 percent

Composition

Percent of survey area: 11
Extent of components in the association:
 Pershing and similar soils—35 percent
 Lindley and similar soils—17 percent
 Rinda and similar soils—14 percent
 Soils of minor extent—34 percent

Soil Properties and Qualities

Pershing

Drainage class: Somewhat poorly drained
Landform: Uplands and stream terraces
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Summits, shoulders, and backslopes
Slope: 2 to 9 percent
Parent material: Loess

Lindley

Drainage class: Well drained
Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope: 9 to 40 percent
Parent material: Glacial till

Rinda

Drainage class: Poorly drained
Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope: 5 to 9 percent
Parent material: Loess over gray paleosol weathered from glacial till

Minor Soils

- Bucknell and similar soils
- Olmitz and similar soils
- Ashgrove and similar soils
- Weller and similar soils

7. Weller-Lindley Association

Setting

Landform: Uplands
Slope range: 2 to 40 percent

Composition

Percent of survey area: 15
Extent of components in the association (fig. 6):
 Weller and similar soils—43 percent
 Lindley and similar soils—25 percent
 Soils of minor extent—32 percent

Soil Properties and Qualities

Weller

Drainage class: Moderately well drained
Landform: Uplands
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Summits, shoulders, and backslopes
Slope: 2 to 14 percent
Parent material: Loess

Lindley

Drainage class: Well drained
Landform: Uplands
Geomorphic component: Nose slopes, head slopes, and side slopes
Hillslope position: Backslopes
Slope: 9 to 40 percent
Parent material: Glacial till

Minor Soils

- Ashgrove and similar soils
- Pershing and similar soils
- Clinton and similar soils
- Nodaway and similar soils
- Beckwith and similar soils

8. Nodaway-Coppock Association

Setting

Landform: Flood plains
Slope range: 0 to 2 percent

Composition

Percent of survey area: 8
Extent of components in the association:
 Nodaway and similar soils—43 percent
 Coppock and similar soils—13 percent
 Soils of minor extent—44 percent

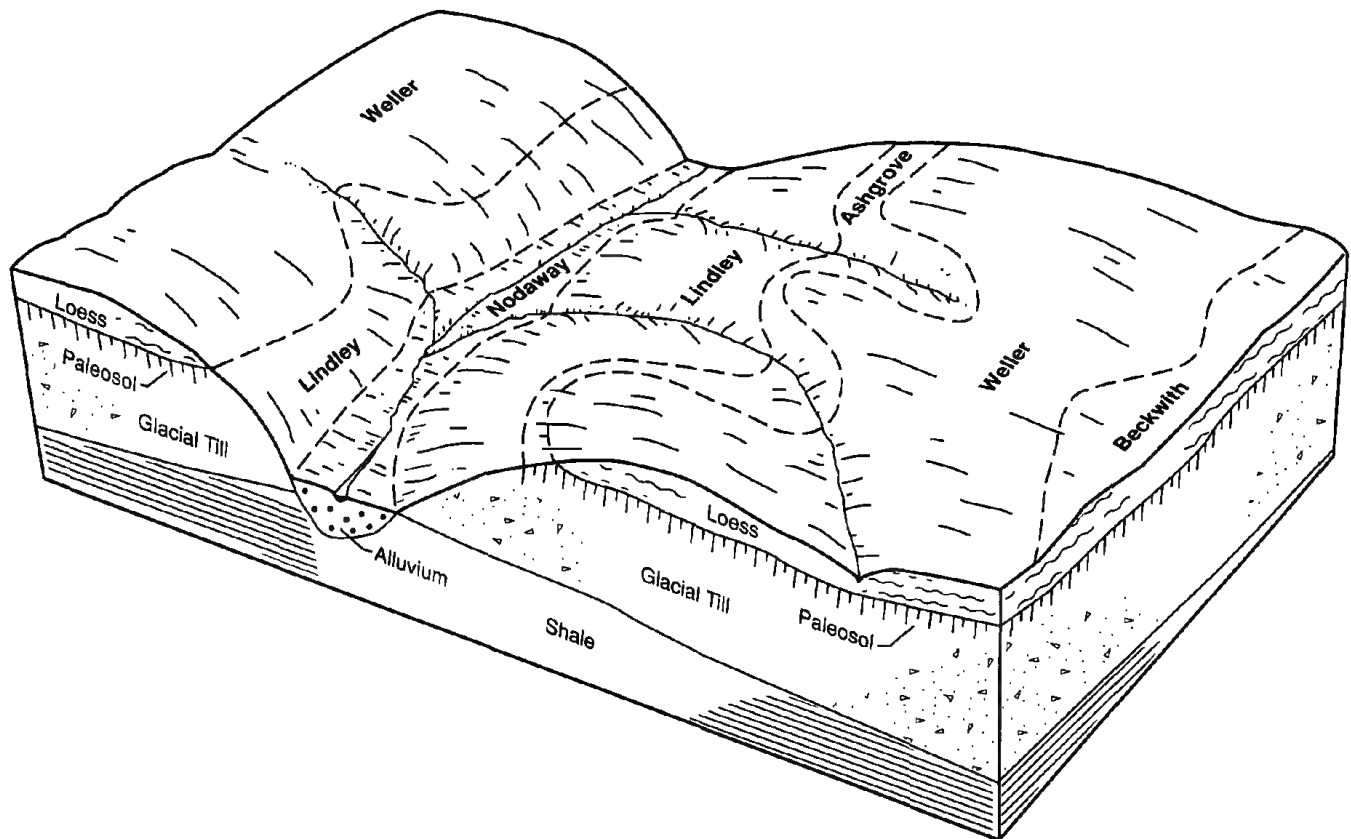


Figure 6.—Typical pattern of soils and parent material in the Weller-Lindley association.

Soil Properties and Qualities

Nodaway

Drainage class: Moderately well drained

Landform: Flood plains

Slope: 0 to 2 percent

Parent material: Silty alluvium

Coppock

Drainage class: Somewhat poorly drained or poorly drained

Landform: Flood plains

Slope: 0 to 2 percent

Parent material: Silty alluvium

Minor Soils

- Vesser and similar soils
- Zook and similar soils
- Klum and similar soils
- Perks and similar soils

Formation and Classification of the Soils

This section relates the soils in the survey area to the major factors of soil formation and describes the system of soil classification. The classification and extent of the soils in this survey area are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the end of this section.

Formation of the Soils

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time the forces of soil formation have acted on the soil material (Jenny, 1941). Human activities also affect soil formation. Climate and plant life are the active factors of soil formation. They act on the parent material and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant life are conditioned by relief. The parent material affects the kind of profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil. Some time is always needed for the development of soil horizons. A long period is needed for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the others.

Parent Material and Geology

Most of the soils in Jefferson County formed in glacial till, or ice-laid material; in loess, or windblown material; or in alluvium, or water-laid material. In some areas the soils formed in material weathered from shale. In a few areas limestone is the parent material. In some small areas the soils formed in eolian, or windblown, sands.

Glacial till.—In Jefferson County, the major Pleistocene depositions of pre-Wisconsin age are Nebraskan and Kansan drift (Scholtes and others, 1951). The Kansan drift is identifiable throughout the county, and on side slopes it forms an extensive part of the landscape. The Nebraskan drift, however, is not readily identifiable on the surface in Jefferson County. In some deep road cuts and along some of the major stream valleys, the Aftonian paleosol is below the Kansan glacial till (Kay, 1916; Kay and Apfel, 1929). This paleosol consists mainly of glacial till made up of coarse fragments in a clay loam matrix. The upper part of the till is yellowish brown material that is oxidized and leached. Below this is dark gray material that is calcareous, contains limestone and dolomite particles, and is neither oxidized nor leached. Soils formed on the Kansan till plain during the Yarmouth and Sangamon interglacial ages, before the loess was deposited. On nearly level interstream divides, the soils were strongly weathered and had a gray, plastic subsoil consisting of paleosol, referred to as gumbotil. This gumbotil is several feet thick and is very slowly permeable. Ashgrove, Bucknell, Clarinda, Lamoni, and Rinda soils formed in this paleosol. These soils are extensive throughout Jefferson County.

Geologic erosion has cut below the Yarmouth-Sangamon paleosol and into the Kansan till and older deposits. Generally, a stone line or subjacent till that is overlain by pedisegment is at the depth to which this erosion has cut (Ruhe, 1956; Ruhe and Daniels, 1958). A paleosol formed in the pedisegment stone line and in the subjacent till. Armstrong and Keswick soils formed in this material.

Geologic erosion removed the loess from many slopes and exposed strongly eroded, weathered paleosols. In some places, the paleosols have been beveled or truncated and only the lower part of the strongly weathered materials remains. In other places erosion has removed all of the paleosols and exposed till that is only slightly weathered.

Erosion cut through below the Yarmouth-Sangamon paleosol during the Late Sangamon (Ruhe, 1956; Ruhe, 1959). The material below the paleosol consists of loamy sediments over a stone line that, in

turn, is over a highly weathered clayey, reddish brown, acid till. Material that formed in the Late Sangamon period is exposed on the narrow, slightly lowered interstream divides on some side slopes. Armstrong and Keswick soils formed in this Late Sangamon material. Douds and Galland soils formed in pre-Sangamon sediments of valley fills. These sediments are old alluvium of glacial origin and have varying textures (Ruhe, 1959). Douds and Galland soils are on low, stepped interfluvies above the present drainage system. These soils occur on a landscape that is partly valley fill but merges with the present erosional uplands. The soils are in distinctly higher positions on the landscape than Gara, Shelby, and Lindley soils, which formed on dissection slopes of Late Wisconsin age. The Sangamon erosional sediments apparently have been angularly truncated in many places. As a result, they generally consist of an irregular mixture of materials that have contrasting textures.

Loess.—Loess of Wisconsin age covers most of Jefferson County and is an extensive parent material in the county (Ruhe and others, 1957; Ruhe and Scholtes, 1955). It consists of accumulated particles of silt and clay that have been deposited by the wind. Variations in soils are related to the distance of the soils from the source of the loess. The source of the loess in Jefferson County is probably the bottom land along the Missouri River in the western part of Iowa (Hutton, 1947).

On the stable upland divides, the loess is about 100 inches thick (Schafer, 1955). It is slightly thicker in the northern part of the county, where Otley, Mahaska, and Taintor soils are the dominant soils. In the southern part of the county, Grundy, Haig, Pershing, and Weller soils are the dominant loess soils. Arispe, Beckwith, Belinda, Clinton, Edina, Fayette, Givin, Hedrick, Inton, Kalona, Keomah, Ladoga, Nira, Rubio, and Sperry soils also formed in loess.

Many of the high benches along the major streams are covered with loess. The loess on these benches contains slightly less clay and slightly more sand than the loess that covers the uplands. The soil material underlying the loess in these areas is stratified alluvium that generally has a high content of sand and gravel.

Alluvium.—Alluvium consists of sediments that have been laid down by water. As the water moved, the sediments were sorted to some extent. They are as well sorted as loess in only a few places. Also, alluvium does not have the wide range of particle sizes that occurs in glacial drift. Because the alluvium in Jefferson County is derived from loess

and glacial drift, it is mainly a mixture of silt and clay, of silt and sand, or of sand and gravel. The coarse sand and gravel generally are only in the pre-Sangamon alluvial sediments on the stream benches.

Sediments that accumulated at the foot of the slope on which they originated are called colluvium or local alluvium. The soils on flood plains, on bottom land, and along drainageways formed in alluvium. As the river overflows its channel and the water spreads over the flood plains, coarse textured material, such as sand and coarse silt, are deposited first. As the floodwater spreads, it moves more slowly and finer textured sediments are deposited. As the floodwater recedes, the clay particles, which are the finest textured particles, settle from the water that is left standing on the lowest part of the flood plain. Nodaway, Klum, and Perks soils commonly are closest to the stream channel and are coarser textured than the other soils on bottom land. Ainsworth, Chequest, Okaw, Richwood, Tuskeego, and Zook soils are along the Skunk River and Cedar Creek and commonly are away from the meanders of the stream. Zook soils commonly are on the lower part of the bottom land. They are the finest textured soils derived from alluvium in the county.

Ackmore, Coppock, and Vesser soils are along the smaller streams in the county. Coppock and Vesser soils are widely distributed throughout the county. In places they formed in local alluvium at the base of upland slopes. Cantril and Olmitz soils are the dominant soils that formed in local alluvium. They commonly contain more sand than the other soils that formed in alluvium. Also, they commonly are in lower positions on the landscape than the surrounding soils that were derived from glacial materials.

Colo soils also formed in local alluvium. The soils that surround the Colo soils formed in loess. In some areas the wind has carried fine sand from the stream channels and the flood plains to higher elevations (Prior, 1976). This sand has been deposited on low stream terraces, high benches, and uplands fringing the leeward side of valleys. Chelsea and Sparta soils formed in eolian sand that is more than 5 feet thick.

Shale residuum.—Some of the oldest parent material in the county is a series of shale beds deposited during the Des Moines sedimentary cycle in the Pennsylvanian period. These beds consist of shale of different colors and textures, conglomerate, and few organic layers, such as coal. The thickness of these beds varies widely. Soils that formed in shale residuum in southern Iowa have a wide range of texture, reaction, and other characteristics. Colors of the shale range from nearly black to red, but red,

brown, and grayish colors are dominant. In places, thin beds of sandstone and coal are between layers of shale. Gosport soils formed in material weathered from brownish and grayish shales.

Limestone.—The oldest parent material in the county is a series of limestone beds deposited during the Mississippian and Pennsylvanian periods (Wood, 1935). Nordness soils are examples of soils that formed in limestone. The limestone beds range from a few inches to several feet in thickness. The thicker beds are good sources of road aggregate and agricultural lime (fig. 7). Several layers of limestone are commonly exposed on the slopes along the major streams and their tributaries. In most places, this exposed rock is many feet thick and rock fragments are on the side slope below the outcrop.

Climate

The soils in Jefferson County have been forming under a midcontinental, subhumid climate for the past 5,000 years (Ruhe, 1956; Ruhe and others, 1957). The morphology and properties of most of the soils indicate that this climate was similar to the present climate. From 6,500 to 16,000 years ago, however, the climate probably was cool and moist and was conducive mostly to the growth of forest vegetation (Ruhe, 1956; Ruhe and others, 1957). A study indicates that the climate during the Sangamon period of the Pleistocene epoch was cool and moist and was conducive mainly to the growth of conifers (Lane, 1941).

The influence of the general climate in a region is



Figure 7.—A limestone quarry in an area of Pits, limestone quarries.

modified by local conditions in or near the developing soils. For example, soils on south-facing slopes formed under a microclimate that was warmer and drier than the average climate of nearby areas. The low-lying, poorly drained soils on bottom land formed under wetter and colder climate than that in most of the surrounding areas. These local differences influence the characteristics of the soil and account for some of the differences among soils in the same general climatic region.

Vegetation

Many changes in climate and vegetation took place in Iowa during the postglacial period (Lane, 1941; Ruhe, 1956). Spruce grew on the soils from 12,000 to 8,000 years ago, followed by a coniferous-deciduous forest, which lasted until about 6,500 years ago. At that time, grass became the dominant vegetation. For the past 5,000 years, the soils of Jefferson County seem to have been influenced by prairie grasses and trees. Big bluestem and little bluestem were the main prairie grasses. The dominant trees were deciduous, mainly oak, hickory, ash, elm, and maple.

The effects of vegetation on soils similar to those in Jefferson County have been studied recently. Evidence shows that the vegetation changed while soils formed in areas bordering trees and grasses. The morphology of Armstrong, Belinda, Bucknell, Cantril, Coppock, Gara, Givin, Hedrick, Ladoga, Pershing, Rinda, Rubio, and Tuskeego soils reflects the influence of both trees and grasses. Trees influenced the formation of Ainsworth, Ashgrove, Beckwith, Chelsea, Clinton, Douds, Fayette, Galland, Gosport, Inton, Keomah, Keswick, Lindley, Nordness, Okaw, and Weller soils (Prill and Riecken, 1958). Grasses influenced the formation of Arispe, Chequest, Clarinda, Colo, Edina, Grundy, Haig, Kalona, Lamoni, Mahaska, Nira, Olmitz, Otley, Richwood, Shelby, Sparta, Sperry, Taintor, Vesser, and Zook soils. Soils that formed under trees are lighter in color and more acid than soils that formed under grasses; also, they have a thinner surface layer. The soils in Jefferson County that formed under changing vegetation or mixed grasses and trees have properties that are intermediate between those of soils that formed under grasses and those of soils that formed under trees.

Relief

Relief indirectly influences soil formation through its effect on drainage. In Jefferson County the slope ranges from level to very steep. In many areas of bottom land, the nearly level soils are occasionally

flooded and have a permanently or periodically high water table. In depressions, water soaks into the nearly level soils that are subject to flooding. Much of the rainfall runs off the steep soils on uplands. Level soils are on the broad upland flats and on the stream bottoms. The steepest soils in the county are generally on the southern and western sides of the major streams and their tributaries.

The intricate pattern of upland drainageways indicates that the landscape in nearly the entire county has been modified by geologic processes. Belinda, Haig, Kalona, Taintor, and similar soils, which formed in areas where the water table is high, have a dominantly grayish subsoil. Gavin, Grundy, Mahaska, Pershing, and similar soils formed in areas where the water table fluctuated and was periodically high. Gara, Lindley, and other soils that formed in areas where the water table was below the subsoil have a yellowish brown subsoil.

Haig and Taintor soils are examples of soils that formed under prairie grasses and have a high water table. They contain more organic matter in the surface layer than well drained soils that formed under prairie grasses. Clay accumulates in the subsoil of Sperry and other soils that are slightly depressional or nearly level. A large amount of water enters the soils and carries the clay particles downward. Sperry soils are commonly considered "claypan" soils because they have a very slowly permeable subsoil, in which the greatest amount of clay accumulates.

Pershing and Weller soils were studied to determine the effects of relief on the formation of soils. From the stable slopes to the unstable slopes where these soils occur, tests showed an increase in content of clay in the A horizon and a decrease in thickness of the A horizon. Soil formation is more pronounced on the more stable slopes. In Gara, Lindley, Shelby, and similar soils that have a wide range in slope and are on many different kinds of slopes, the depth to carbonates is shallowest where the slopes are steepest, are convex, or are most unstable.

Time

The length of time required for a soil to form affects the kind of soil that forms. An older or more strongly developed soil has well defined genetic horizons, whereas a less well developed soil has no genetic horizons or has only weakly defined ones. Most soils on the flood plains are weakly developed because they have not been in place long enough for the development of distinct horizons. In the steeper areas, material is generally removed before a thick

profile that has strongly defined horizons has had time to develop. Even though the material has been in place for a long time, the soil may be immature because much of the water runs off the slopes rather than through the soil material. Shelby, Gara, and Lindley soils formed on recently dissected slopes of late Wisconsin age (Ruhe, 1956; Ruhe, 1959). These soils are no more than 11,000 to 14,000 years old and probably are much younger.

Ashgrove, Armstrong, Keswick, Clarinda, Rinda, and Galland soils are among the oldest soils in the county (Ruhe, 1959; Ruhe and Scholtes, 1955). Clarinda, Rinda, and Ashgrove soils formed in Kansan glacial till during the Yarmouth-Sangamon period. Armstrong, Keswick, and Galland soils formed in material deposited during the Late Sangamon interglacial stage. This material is much older than the loessial parent material in which the Arispe, Beckwith, Belinda, Clinton, Haig, Grundy, Kalona, Mahaska, Otley, Nira, Pershing, Taintor, and Weller soils formed. These soils are no more than 14,000 to 16,000 years old, and they may be considered younger (Ruhe, 1959).

Radiocarbon studies of wood fragments and organic matter in loess and glacial till have made it possible to determine the approximate ages of soils and loess and glacial deposits of Iowa. In Jefferson County the loess is thickest in the nearly level soils on stable upland divides. It is underlain by a Yarmouth-Sangamon paleosol that is on the Kansan till surface. In many places below the stable uplands, an organic layer is at the base of the loess. Organic matter below the solum of the Edina and Haig soils in Wayne County, Iowa, had radiocarbon ages of 19,000 to 20,000 years.

Human Activities

Important changes take place when the soil is cultivated. Some of these changes have little effect on productivity; others have drastic effects. The changes caused by water erosion generally are the most significant. On many of the cultivated soils in the county, particularly the gently rolling to hilly soils, part or all of the original surface layer has been lost through sheet erosion. In places, shallow to deep gullies have formed. In many fields that are cultivated year after year, the granular structure that was apparent when the grassland was undisturbed has broken down. In these fields the surface tends to crust and harden when it dries. Fine textured soils that have been plowed when too wet tend to puddle and are less permeable than similar soils in undisturbed areas.

Humans have increased the productivity of some soils. Large areas of bottom land have been made suitable for cultivation because drainage ditches have been dug and diversions have been constructed at the foot of slopes. The cropland in areas of Taintor and Haig soils on broad flats has been greatly improved because a drainage system has been installed. Deficiencies in plant nutrients have been counteracted in some areas. Some soils are more productive than they were in their natural state because of applications of commercial fertilizer.

Processes of Horizon Differentiation

Horizons are differentiated from each other when four basic kinds of change take place. These are additions, removals, transfers, and transformations (Simonson, 1959). Each of these changes affects many substances in the soils, such as organic matter, soluble salts, carbonates, sesquioxides, and silicate clay materials. Most of these processes tend to promote horizon differentiation, but some tend to offset or retard it. The processes and the resulting changes occur simultaneously in soils. The ultimate nature of the profile is governed by the balance of these changes within the soil.

An accumulation of organic matter generally is an early phase of horizon differentiation. It has been an important process in the differentiation of horizons in the soils of Jefferson County. The amount of organic matter that has accumulated in the surface layer of the soils ranges from high to very low. In some soils the content of organic matter formerly was fairly high but is now low because of erosion.

The removal of substances from parts of the soil profile is important in the differentiation of horizons. The downward movement of calcium carbonates and bases is an example. The upper part of the soils in Jefferson County has been leached of calcium carbonate. Many soils have been so strongly leached that they are strongly acid or very strongly acid even in the subsoil. Phosphorus is removed from the subsoil by plant roots and transferred to the parts of the plant growing above the ground. It is then returned to the surface layer in the plant residue. This process affects the form and distribution of phosphorus in the profile.

The translocation of silicate clay minerals is another important process. The clay minerals in the surface layer are carried downward in suspension by percolating water. They accumulate in the subsoil as fillings in pores and root channels and as clay films. This process has affected many of the soils in the county. In other soils, however, the clay content of the

surface layer is not markedly different from that of the underlying layer and other evidence of clay movement is minimal.

Another kind of transfer occurs when cracks form as a result of shrinking and swelling. Because of the cracks, some of the material from the surface layer is transferred to the lower parts of the profile. This transfer is minimal in most soils. It is most common in very clayey soils. It can occur in Clarinda and Zook soils.

Transformations are physical and chemical. The weathering of soil particles to smaller sizes is an example of a transformation. The reduction of iron is another example. This process is called gleying. It occurs when the soil is saturated for long periods. The soil contains enough organic matter for biological activity to take place during periods of saturation. Gleying is evidenced by ferrous iron and gray colors in the soil. It is characteristic of poorly drained soils, such as Haig soils. The content of reductive extractable iron, or free iron, generally is lower in somewhat poorly drained soils, such as Grundy soils (USDA, 1984). Another kind of transformation is the weathering of the primary apatite minerals in the parent material to secondary phosphorus compounds.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. The table "Classification of the Soils" in Parts I and II of this publication shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil

genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aquoll (*Aqu*, meaning water, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haplaquolls (*Hapl*, meaning minimal horizonation, plus *aquoll*, the suborder of the Mollisols that has an aquatic moisture regime).

SUBGROUP. Each great group has a typical subgroup. Other subgroups are intergrades or extragrades. The *typic* is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is *Typic Haplaquolls*.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is *fine, montmorillonitic, mesic Typic Haplaquolls*.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Classification of the Soils

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Ackmore-----	Aeric Fluvaquents, fine-silty, mixed, nonacid, mesic
Ainsworth-----	Typic Hapludalfs, fine, montmorillonitic, mesic
*Arispe-----	Aquic Argiudolls, fine, montmorillonitic, mesic
Armstrong-----	Aquollic Hapludalfs, fine, montmorillonitic, mesic
Ashgrove-----	Aeric Ochraqualfs, fine, montmorillonitic, mesic, sloping
Beckwith-----	Typic Albaqualfs, fine, montmorillonitic, mesic
Belinda-----	Mollic Albaqualfs, fine, montmorillonitic, mesic
Bucknell-----	Udollic Ochraqualfs, fine, montmorillonitic, mesic, sloping
Cantril-----	Udollic Ochraqualfs, fine-loamy, mixed, mesic
Chelsea-----	Alfic Udipsamments, mixed, mesic
Chequest-----	Typic Haplaquolls, fine, montmorillonitic, mesic
Clarinda-----	Typic Argiaquolls, fine, montmorillonitic, mesic, sloping
Clinton-----	Typic Hapludalfs, fine, montmorillonitic, mesic
Colo-----	Cumulic Haplaquolls, fine-silty, mixed, mesic
Coppock-----	Mollic Ochraqualfs, fine-silty, mixed, mesic
Douds-----	Typic Hapludalfs, fine-loamy, mixed, mesic
Edina-----	Typic Argialbolls, fine, montmorillonitic, mesic
Fayette-----	Typic Hapludalfs, fine-silty, mixed mesic
Galland-----	Aquic Hapludalfs, fine, montmorillonitic, mesic
Gara-----	Mollic Hapludalfs, fine-loamy, mixed, mesic
Givin-----	Udollic Ochraqualfs, fine, montmorillonitic, mesic
Gosport-----	Typic Dystrochrepts, fine, illitic, mesic
Grundy-----	Aquic Argiudolls, fine, montmorillonitic, mesic
Haig-----	Typic Argiaquolls, fine, montmorillonitic, mesic
Hedrick-----	Mollic Hapludalfs, fine-silty, mixed, mesic
Inton-----	Typic Hapludalfs, fine-silty, mixed mesic
Kalona-----	Typic Haplaquolls, fine, montmorillonitic, mesic
Keomah-----	Aeric Ochraqualfs, fine, montmorillonitic, mesic
Keswick-----	Aquic Hapludalfs, fine, montmorillonitic, mesic
Klun-----	Mollic Udifluvents, coarse-loamy, mixed, nonacid, mesic
Ladoga-----	Mollic Hapludalfs, fine, montmorillonitic, mesic
*Lamoni-----	Aquic Argiudolls, fine, montmorillonitic, mesic
Lindley-----	Typic Hapludalfs, fine-loamy, mixed, mesic
Mahaska-----	Aquic Argiudolls, fine, montmorillonitic, mesic
*Nira-----	Typic Hapludolls, fine-silty, mixed, mesic
Nodaway-----	Mollic Udifluvents, fine-silty, mixed, nonacid, mesic
Nordness-----	Lithic Hapludalfs, loamy, mixed, mesic
Okaw-----	Typic Albaqualfs, fine, montmorillonitic, mesic
Olmitz-----	Cumulic Hapludolls, fine-loamy, mixed, mesic
Orthents-----	Orthents
Otley-----	Typic Argiudolls, fine, montmorillonitic, mesic
Perks-----	Typic Udipsamments, mixed, mesic
Pershing-----	Aquollic Hapludalfs, fine, montmorillonitic, mesic
Richwood-----	Typic Argiudolls, fine-silty, mixed, mesic
Rinda-----	Mollic Ochraqualfs, fine, montmorillonitic, mesic, sloping
Rubio-----	Mollic Albaqualfs, fine, montmorillonitic, mesic
*Shelby-----	Typic Argiudolls, fine-loamy, mixed, mesic
Sparta-----	Entic Hapludolls, sandy, mixed, mesic
Sperry-----	Typic Argialbolls, fine, montmorillonitic, mesic
Taintor-----	Typic Argiaquolls, fine, montmorillonitic, mesic
Tuskeego-----	Mollic Ochraqualfs, fine, montmorillonitic, mesic
Vesser-----	Argiaquic Argialbolls, fine-silty, mixed, mesic
Weller-----	Aquic Hapludalfs, fine, montmorillonitic, mesic
Zook-----	Cumulic Haplaquolls, fine, montmorillonitic, mesic

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
13B	Olmitz-Vesser-Zook complex, 0 to 5 percent slopes-----	8,290	2.9
23C2	Arispe silty clay loam, 5 to 9 percent slopes, moderately eroded-----	1,500	0.5
24D2	Shelby clay loam, 9 to 14 percent slopes, moderately eroded-----	1,780	0.6
41B	Sparta loamy fine sand, 2 to 5 percent slopes-----	130	*
51	Vesser silt loam, 0 to 2 percent slopes-----	1,230	0.4
51B	Vesser silt loam, 2 to 5 percent slopes-----	390	0.1
54	Zook silty clay loam, 0 to 2 percent slopes-----	810	0.3
65D2	Lindley loam, 9 to 14 percent slopes, moderately eroded-----	4,240	1.5
65E	Lindley loam, 14 to 18 percent slopes-----	2,210	0.8
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded-----	7,360	2.6
65F2	Lindley loam, 18 to 25 percent slopes, moderately eroded-----	1,370	0.5
65G	Lindley loam, 25 to 40 percent slopes-----	7,560	2.7
74	Rubio silt loam, 0 to 2 percent slopes-----	470	0.2
75	Givin silt loam, 0 to 2 percent slopes-----	1,600	0.6
75B	Givin silt loam, 2 to 5 percent slopes-----	3,590	1.3
76B	Ladoga silt loam, 2 to 5 percent slopes-----	4,190	1.5
76C2	Ladoga silty clay loam, 5 to 9 percent slopes, moderately eroded-----	8,360	3.0
76D2	Ladoga silty clay loam, 9 to 14 percent slopes, moderately eroded-----	200	*
80B	Clinton silt loam, 2 to 5 percent slopes-----	2,160	0.8
80C2	Clinton silty clay loam, 5 to 9 percent slopes, moderately eroded-----	9,410	3.3
80D2	Clinton silty clay loam, 9 to 14 percent slopes, moderately eroded-----	3,380	1.2
87B	Colo-Zook complex, 0 to 5 percent slopes-----	200	*
122	Sperry silt loam, 0 to 1 percent slopes-----	410	0.1
130	Belinda silt loam, 0 to 2 percent slopes-----	1,100	0.4
131B	Pershing silt loam, 2 to 5 percent slopes-----	5,200	1.8
131B2	Pershing silty clay loam, 2 to 5 percent slopes, moderately eroded-----	320	0.1
131C2	Pershing silty clay loam, 5 to 9 percent slopes, moderately eroded-----	6,330	2.3
132B	Weller silt loam, 2 to 5 percent slopes-----	3,190	1.1
132C	Weller silt loam, 5 to 9 percent slopes-----	430	0.2
132C2	Weller silty clay loam, 5 to 9 percent slopes, moderately eroded-----	9,140	3.2
132D	Weller silt loam, 9 to 14 percent slopes-----	280	*
132D2	Weller silty clay loam, 9 to 14 percent slopes, moderately eroded-----	3,830	1.4
139	Perks loamy sand, 1 to 3 percent slopes-----	200	*
179D2	Gara clay loam, 9 to 14 percent slopes, moderately eroded-----	4,350	1.5
179E2	Gara clay loam, 14 to 18 percent slopes, moderately eroded-----	1,260	0.4
180	Keomah silt loam, 0 to 2 percent slopes-----	200	*
180B	Keomah silt loam, 2 to 5 percent slopes-----	410	0.1
208	Klum fine sandy loam, 0 to 2 percent slopes-----	440	0.2
211	Edina silt loam, depressional, 0 to 1 percent slopes-----	80	*
220	Nodaway silt loam, 0 to 2 percent slopes-----	7,320	2.6
222C	Clarinda silty clay loam, 5 to 9 percent slopes-----	830	0.3
222C2	Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded-----	7,820	2.8
223C2	Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded-----	10,050	3.6
260	Beckwith silt loam, 0 to 2 percent slopes-----	530	0.2
263	Okaw silt loam, 0 to 2 percent slopes-----	250	*
264B	Ainsworth silt loam, 2 to 5 percent slopes-----	270	*
273B	Olmitz loam, 2 to 5 percent slopes-----	210	*
279	Taintor silty clay loam, 0 to 2 percent slopes-----	15,400	5.5
280	Mahaska silty clay loam, 0 to 2 percent slopes-----	7,390	2.6
280B	Mahaska silty clay loam, 2 to 5 percent slopes-----	13,450	4.8
281B	Otley silty clay loam, 2 to 5 percent slopes-----	6,200	2.2
281B2	Otley silty clay loam, 2 to 5 percent slopes, moderately eroded-----	850	0.3
281C	Otley silty clay loam, 5 to 9 percent slopes-----	330	0.1
281C2	Otley silty clay loam, 5 to 9 percent slopes, moderately eroded-----	5,970	2.1
293C	Chelsea-Fayette complex, 5 to 9 percent slopes-----	260	*
293F	Chelsea-Fayette complex, 18 to 25 percent slopes-----	430	0.2
313E2	Gosport silty clay loam, 14 to 18 percent slopes, moderately eroded-----	260	*
313G	Gosport silty clay loam, 25 to 40 percent slopes-----	350	0.1
315	Nodaway-Klum-Perks complex, 0 to 3 percent slopes-----	410	0.1
362	Haig silt loam, 0 to 2 percent slopes-----	14,560	5.2
363	Haig silty clay loam, 0 to 1 percent slopes-----	350	0.1

See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
364B	Grundy silty clay loam, 2 to 5 percent slopes-----	8,520	3.0
364B2	Grundy silty clay loam, 2 to 5 percent slopes, moderately eroded-----	1,740	0.6
423D2	Bucknell silty clay loam, 9 to 14 percent slopes, moderately eroded-----	4,750	1.7
424D2	Lindley-Keswick complex, 9 to 14 percent slopes, moderately eroded-----	1,500	0.5
424E2	Lindley-Keswick complex, 14 to 18 percent slopes, moderately eroded-----	1,690	0.6
425D	Keswick loam, 9 to 14 percent slopes-----	450	0.2
425D2	Keswick clay loam, 9 to 14 percent slopes, moderately eroded-----	1,460	0.5
430	Ackmore silt loam, 0 to 2 percent slopes-----	660	0.2
453	Tuskeego silt loam, 0 to 2 percent slopes-----	270	*
499G	Nordness silt loam, 25 to 40 percent slopes-----	240	*
520	Coppock silt loam, 0 to 2 percent slopes-----	2,140	0.8
520B	Coppock silt loam, 2 to 5 percent slopes-----	1,920	0.7
570C2	Nira silty clay loam, 5 to 9 percent slopes, moderately eroded-----	6,960	2.5
571C2	Hedrick silty clay loam, 5 to 9 percent slopes, moderately eroded-----	6,240	2.2
572C2	Inton silty clay loam, 5 to 9 percent slopes, moderately eroded-----	1,270	0.5
572D2	Inton silty clay loam, 9 to 14 percent slopes, moderately eroded-----	570	0.2
587	Chequest silty clay loam, 0 to 2 percent slopes-----	890	0.3
594D2	Galland clay loam, 9 to 14 percent slopes, moderately eroded-----	1,440	0.5
729	Nodaway-Coppock complex, 0 to 2 percent slopes-----	1,300	0.5
730B	Nodaway-Coppock-Cantril complex, 2 to 5 percent slopes-----	3,880	1.4
779	Kalona silty clay loam, 0 to 1 percent slopes-----	1,600	0.6
792C2	Armstrong clay loam, 5 to 9 percent slopes, moderately eroded-----	200	*
792D2	Armstrong clay loam, 9 to 14 percent slopes, moderately eroded-----	570	0.2
795C2	Ashgrove silty clay loam, 5 to 9 percent slopes, moderately eroded-----	1,280	0.5
795D2	Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded-----	7,320	2.6
822D2	Lamoni silty clay loam, 9 to 14 percent slopes, moderately eroded-----	430	0.2
831B	Pershing silt loam, bench, 2 to 5 percent slopes-----	490	0.2
831C2	Pershing silty clay loam, bench, 5 to 9 percent slopes, moderately eroded-----	380	0.1
832B	Weller silt loam, bench, 2 to 5 percent slopes-----	1,110	0.4
832C2	Weller silty clay loam, bench, 5 to 9 percent slopes, moderately eroded-----	2,030	0.7
832D2	Weller silty clay loam, bench, 9 to 14 percent slopes, moderately eroded-----	380	0.1
876B	Ladoga silt loam, bench, 2 to 5 percent slopes-----	200	*
876C2	Ladoga silty clay loam, bench, 5 to 9 percent slopes, moderately eroded-----	300	0.1
880B	Clinton silt loam, bench, 2 to 5 percent slopes-----	510	0.2
880C2	Clinton silty clay loam, bench, 5 to 9 percent slopes, moderately eroded-----	2,070	0.7
880D2	Clinton silty clay loam, bench, 9 to 14 percent slopes, moderately eroded-----	650	0.2
977	Richwood silt loam, 0 to 2 percent slopes-----	290	0.1
993D2	Gara-Armstrong complex, 9 to 14 percent slopes, moderately eroded-----	1,650	0.6
993E2	Gara-Armstrong complex, 14 to 18 percent slopes, moderately eroded-----	320	0.1
994D2	Galland-Douds complex, 9 to 14 percent slopes, moderately eroded-----	760	0.3
994E2	Galland-Douds complex, 14 to 18 percent slopes, moderately eroded-----	900	0.3
1075B	Givin silt loam, bench, 2 to 5 percent slopes-----	260	*
1130	Belinda silt loam, bench, 0 to 2 percent slopes-----	220	*
1260	Beckwith silt loam, bench, 0 to 2 percent slopes-----	270	*
1715	Nodaway-Vesser-Ackmore complex, 0 to 2 percent slopes-----	7,210	2.6
5020	Pits and Dumps-----	50	*
5030	Pits, limestone quarries-----	140	*
5040	Orthents, loamy-----	160	*
	Water-----	570	0.2
	Total-----	281,300	100.0

* Less than 0.1 percent.

Soil Series and Detailed Soil Map Units

In this section, arranged in alphabetical order, each soil series recognized in the survey area is described. Each series description is followed by descriptions of the associated detailed soil map units.

Characteristics of the soil and the material in which it formed are identified for each soil series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1975). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units on the detailed maps in Part III of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information about each map unit is given in Part II of this survey.

A map unit delineation on the detailed soil maps represents an area on the landscape and consists of one or more soils or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit,

and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit. The principal hazards and limitations to be considered in planning for specific uses are described in Part II of this survey.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness,

degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Arispe silty clay loam, 5 to 9 percent slopes, moderately eroded, is a phase of the Arispe series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are called soil complexes.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Olmitz-Vesser-Zook complex, 0 to 5 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The map unit Pits and Dumps is an example.

The table "Acreage and Proportionate Extent of the Soils" in Parts I and II of this publication gives the acreage and proportionate extent of each map unit. Other tables (see Contents) give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Ackmore Series

Drainage class: Somewhat poorly drained

Permeability: Moderate

Landform: Flood plains

Parent material: Silty alluvium

Native vegetation: Prairie

Slope range: 0 to 2 percent

Typical Pedon

Ackmore silt loam, in an area of Nodaway-Vesser-Ackmore complex, 0 to 2 percent slopes, 1,260 feet south and 1,160 feet east of the northwest corner of sec. 32, T. 73 N., R. 9 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

C—8 to 27 inches; stratified very dark gray (10YR 3/1) and dark grayish brown (10YR 4/2) silt loam;

massive; friable; few fine roots; slightly acid; clear smooth boundary.

2Ab1—27 to 34 inches; black (10YR 2/1) silty clay loam; common fine distinct brown (10YR 4/3) mottles; weak very fine and fine subangular blocky structure; friable; few fine roots; few fine irregular soft masses of iron-manganese; moderately acid; clear smooth boundary.

2Ab2—34 to 45 inches; black (10YR 2/1) silty clay loam; common fine distinct brown (10YR 4/3) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few fine roots; few fine irregular soft masses of iron-manganese; moderately acid; clear smooth boundary.

2Ab3—45 to 52 inches; very dark gray (10YR 3/1) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm; few fine roots; few fine irregular soft masses of iron-manganese; moderately acid; clear smooth boundary.

2Bbg—52 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine prominent yellowish brown (10YR 5/8 and 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common very dark gray (10YR 3/1) organic coatings on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid.

Range in Characteristics

Depth to 2Ab horizon: 20 to 36 inches

Ap horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

C horizon:

Hue—10YR

Value—2 to 5

Chroma—1 or 2

Texture—silt loam

2Ab horizon:

Hue—10YR or neutral

Value—2 or 3

Chroma—0 to 2

Texture—silty clay loam or silt loam

2Bbg horizon:

Hue—5Y to neutral

Value—4 or 5
 Chroma—0 to 2
 Texture—silty clay loam or silt loam

430—Ackmore silt loam, 0 to 2 percent slopes

Composition

Ackmore and similar soils: About 95 percent
 Inclusions: About 5 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Occasional
Depth to the water table: 1 to 3 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.2 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas that do not have a buried soil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Ainsworth Series

Drainage class: Moderately well drained
Permeability: Moderately slow in the upper part and rapid in the lower part

Landform: Stream terraces
Parent material: Local alluvium
Native vegetation: Forest
Slope range: 2 to 5 percent

Typical Pedon

Ainsworth silt loam, 2 to 5 percent slopes, 1,990 feet north and 210 feet west of the southeast corner of sec. 31, T. 72 N., R. 10 W.

- Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; few fine roots; many distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds and in pores; slightly acid; abrupt smooth boundary.
- Bt1—8 to 16 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; many distinct dark brown (10YR 3/3) organic coatings on faces of peds and in pores and few distinct clay films on faces of peds; slightly acid; clear smooth boundary.
- Bt2—16 to 25 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate very fine and fine subangular blocky structure; firm; few fine roots; common distinct dark brown (10YR 3/3) organic coatings on faces of peds and in pores and clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.
- Bt3—25 to 33 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.
- Bt4—33 to 42 inches; yellowish brown (10YR 5/4) silty clay loam; many fine distinct light brownish gray (10YR 6/2) and common prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; abrupt wavy boundary.
- 2BC—42 to 49 inches; yellowish brown (10YR 5/4) sandy loam; weak fine and medium subangular blocky structure; friable; strongly acid; clear wavy boundary.
- 2C—49 to 60 inches; dark yellowish brown (10YR 4/4) sand; single grain; friable; moderately acid.

Range in Characteristics

Thickness of the solum: 40 to 60 inches

Ap horizon:

Hue—10YR
 Value—4 or 5
 Chroma—2 or 3
 Texture—silt loam

E horizon (if it occurs):

Hue—10YR
 Value—4 to 6
 Chroma—2 or 3
 Texture—silt loam

Bt horizon:

Hue—10YR or 7.5YR
 Value—4 or 5
 Chroma—3 or 4
 Texture—silty clay loam

2BC horizon:

Hue—10YR
 Value—4 or 5
 Chroma—3 or 4
 Texture—sandy loam

2C horizon:

Hue—10YR
 Value—4 or 5
 Chroma—3 or 4
 Texture—sand

264B—Ainsworth silt loam, 2 to 5 percent slopes

Composition

Ainsworth and similar soils: About 95 percent
 Inclusions: About 5 percent

Setting

Landform: Stream terraces
Geomorphic component: Side slopes
Hillslope position: Summits, shoulders, and backslopes
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Local alluvium
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 8.9 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a substratum of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Arispe Series

Drainage class: Somewhat poorly drained

Permeability: Slow

Landform: Uplands

Parent material: Loess

Native vegetation: Prairie

Slope range: 5 to 9 percent

Taxadjunct features: The Arispe soils in this county do not have a mollic epipedon.

Typical Pedon

Arispe silty clay loam, 5 to 9 percent slopes, moderately eroded, 1,245 feet east and 980 feet north of the southwest corner of sec. 15, T. 71 N., R. 11 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 5/1) dry; about 30 percent streaks and pockets of dark grayish brown (10YR 4/2) subsoil material; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

Btg1—8 to 13 inches; dark grayish brown (10YR 4/2) and dark gray (10YR 4/1) silty clay loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; firm; few fine roots; many distinct clay films on faces of peds and very few faint very dark grayish brown (10YR 3/2) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; neutral; clear smooth boundary.

Btg2—13 to 18 inches; dark grayish brown (10YR

4/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) and few fine prominent yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds and very few faint very dark grayish brown (10YR 3/2) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; neutral; gradual smooth boundary.

Btg3—18 to 31 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/4) and common fine prominent yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds and few faint very dark grayish brown (10YR 3/2) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; neutral; gradual smooth boundary.

Btg4—31 to 42 inches; dark grayish brown (2.5Y 4/2) silty clay loam; many fine and medium prominent yellowish brown (10YR 5/6) and few fine prominent brown (7.5YR 5/4) and strong brown (7.5YR 5/8) mottles; weak fine subangular blocky structure; firm; few fine roots; common prominent clay films on faces of peds and few distinct very dark grayish brown (10YR 3/2) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; neutral; gradual smooth boundary.

BCg—42 to 52 inches; dark grayish brown (2.5Y 4/2) silt loam; common fine prominent yellowish brown (10YR 5/8) and few fine prominent strong brown (7.5YR 4/6 and 5/8) mottles; weak medium prismatic structure; friable; few fine roots; few distinct clay films on faces of peds and few distinct very dark grayish brown (10YR 3/2) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; neutral; clear smooth boundary.

2Bbtg—52 to 60 inches; gray (5Y 5/1) silty clay; few fine prominent strong brown (7.5YR 4/6) mottles; moderate medium and coarse subangular blocky structure; very firm; few fine irregular soft masses of iron-manganese; neutral.

Range in Characteristics

Thickness of the solum: 36 to 60 inches

Ap horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silty clay loam

Btg horizon:

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—2 or 3

Texture—silty clay loam or silty clay

BCg horizon:

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—2 or 3

Texture—silt loam or silty clay loam

2Bbtg horizon:

Hue—2.5Y or 5Y

Value—4 to 6

Chroma—1 or 2

Texture—silty clay or silty clay loam

23C2—Arispe silty clay loam, 5 to 9 percent slopes, moderately eroded

Composition

Arispe and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Shoulders, backslopes, and summits

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)

Content of organic matter in the surface layer: About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Clarinda and similar soils

- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Armstrong Series

Drainage class: Moderately well drained

Permeability: Slow

Landform: Uplands

Parent material: Pedisements over reddish paleosol weathered from glacial till

Native vegetation: Mixed grasses and deciduous trees

Slope range: 5 to 18 percent

Typical Pedon

Armstrong clay loam, 5 to 9 percent slopes, moderately eroded, 260 feet west and 1,980 feet north of the southeast corner of sec. 25, T. 73 N., R. 10 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) clay loam, brown (10YR 5/3) dry; about 20 percent streaks and pockets of brown (7.5YR 4/4) subsoil material; weak fine granular structure; friable; few fine roots; moderately acid; clear smooth boundary.

Bt1—7 to 11 inches; brown (7.5YR 4/4) clay loam; weak very fine subangular blocky structure; friable; few fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds and few faint silt coatings on faces of peds and in pores; strongly acid; clear smooth boundary.

Bt2—11 to 19 inches; strong brown (7.5YR 4/6) clay loam; weak very fine and fine subangular blocky structure; friable; few fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; strongly acid; clear smooth boundary.

2Bt3—19 to 23 inches; strong brown (7.5YR 4/6) clay; few fine prominent grayish brown (10YR 5/2) and yellowish red (5YR 4/6) mottles; moderate medium angular blocky structure; firm; few fine roots; stone line in the upper part; many

prominent dark grayish brown (10YR 4/2) clay films on faces of peds; 2 percent pebbles; moderately acid; gradual smooth boundary.

2Bt4—23 to 34 inches; strong brown (7.5YR 5/6) clay loam; common fine prominent red (2.5YR 4/6) and few yellowish brown (10YR 5/8) and brown (10YR 5/3) mottles; moderate medium prismatic structure parting to moderate fine angular blocky; firm; few fine roots; many prominent dark grayish brown (10YR 4/2) clay films on faces of peds; few fine irregular soft masses of iron-manganese; 2 percent pebbles; slightly acid; gradual smooth boundary.

2Bt5—34 to 47 inches; strong brown (7.5YR 5/6) clay loam; common fine prominent grayish brown (10YR 5/2) and distinct yellowish brown (10YR 5/6) mottles; moderate medium and coarse prismatic structure parting to moderate fine angular blocky; firm; few fine roots; many prominent dark grayish brown (10YR 4/2) clay films on faces of peds; few fine irregular soft masses of iron-manganese; 1 percent pebbles; neutral; gradual smooth boundary.

2Bt6—47 to 60 inches; strong brown (7.5YR 5/6) clay loam; few fine prominent grayish brown (10YR 5/2) and common yellowish brown (10YR 5/8) mottles; weak medium and coarse prismatic structure parting to moderate fine angular blocky; firm; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine irregular soft masses of iron-manganese; neutral.

Range in Characteristics

Thickness of the solum: 42 to more than 60 inches

Ap horizon:

Hue—10YR

Value—3 or 4

Chroma—1 or 2

Texture—clay loam

Bt horizon:

Hue—7.5YR, 5YR, or 10YR

Value—4 or 5

Chroma—2 to 6

Texture—clay loam

2Bt horizon:

Hue—7.5YR or 5YR

Value—4 or 5

Chroma—2 to 6

Texture—clay, clay loam, or silty clay

792C2—Armstrong clay loam, 5 to 9 percent slopes, moderately eroded***Composition***

Armstrong and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Backslopes and shoulders
Slope: 5 to 9 percent

Component Description

Surface layer texture: Clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Pedisements over reddish paleosol weathered from glacial till
Flooding: None
Depth to the water table: 1 to 3 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 8.6 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Gara and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

792D2—Armstrong clay loam, 9 to 14 percent slopes, moderately eroded***Composition***

Armstrong and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Pedisements over reddish paleosol weathered from glacial till
Flooding: None
Depth to the water table: 1 to 3 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 8.6 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Gara and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Ashgrove Series

Drainage class: Poorly drained

Permeability: Very slow

Landform: Uplands

Parent material: Loess over gray paleosol weathered from glacial till

Native vegetation: Forest

Slope range: 5 to 14 percent

Typical Pedon

Ashgrove silty clay loam, 5 to 9 percent slopes, moderately eroded, 280 feet east and 1,640 feet south of the center of sec. 35, T. 73 N., R. 9 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silty clay loam, pale brown (10YR 6/3) dry; about 20 percent streaks and pockets of brown (10YR 5/3) subsoil material; weak fine granular structure; friable; few fine roots; moderately acid; abrupt smooth boundary.

BE—5 to 9 inches; brown (10YR 5/3) silty clay loam, pale brown (10YR 6/3) dry; weak thin platy structure; friable; few fine roots; few distinct light gray (10YR 7/2) silt coatings on faces of peds; strongly acid; clear smooth boundary.

2Bt—9 to 18 inches; brown (10YR 4/3) silty clay; common fine distinct gray (10YR 5/1), grayish brown (10YR 5/2), and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very firm; few fine roots; few distinct clay films on faces of peds; strongly acid; gradual smooth boundary.

2Btg1—18 to 30 inches; grayish brown (10YR 5/2) clay; common fine faint gray (10YR 5/1) and distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very firm; few fine roots; few distinct clay films on faces of peds; 1 percent pebbles; strongly acid; gradual smooth boundary.

2Btg2—30 to 37 inches; light gray (5Y 6/1) clay; common fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very firm; few distinct clay films on faces of peds; 1 percent pebbles; strongly acid; gradual smooth boundary.

2Btg3—37 to 45 inches; light gray (5Y 6/1) clay; many medium and coarse prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak medium subangular blocky structure; very firm; few distinct clay films on faces of peds; 1 percent pebbles; moderately acid; gradual smooth boundary.

2C—45 to 60 inches; mottled gray (5Y 5/1) and

yellowish brown (10YR 5/6 and 5/8) clay loam; massive; very firm; 1 percent pebbles; slightly acid.

Range in Characteristics

Thickness of the solum: 42 to 60 inches

Ap horizon:

Hue—10YR

Value—4 or 5

Chroma—1 to 3

Texture—silty clay loam

BE horizon:

Hue—10YR

Value—5

Chroma—2 or 3

Texture—silt loam or silty clay loam

2Bt horizon:

Hue—10YR

Value—4 or 5

Chroma—2 to 4

Texture—silty clay loam or silty clay

2Btg horizon:

Hue—10YR, 2.5Y, or 5Y

Value—4 to 6

Chroma—1 to 3

Texture—clay or silty clay

2C horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5

Chroma—1 to 6

Texture—clay loam

795C2—Ashgrove silty clay loam, 5 to 9 percent slopes, moderately eroded

Composition

Ashgrove and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes and shoulders

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Loess over gray paleosol weathered from glacial till

Flooding: None

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 8.3 inches (moderate)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lindley and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

795D2—Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded

Composition

Ashgrove and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 9 to 14 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Loess over gray paleosol weathered from glacial till

Flooding: None

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 8.2 inches (moderate)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lindley and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Beckwith Series

Drainage class: Poorly drained

Permeability: Very slow

Landform: Uplands and stream terraces

Parent material: Loess

Native vegetation: Forest

Slope range: 0 to 2 percent

Typical Pedon

Beckwith silt loam, 0 to 2 percent slopes, 288 feet north and 1,530 feet west of the center of sec. 29, T. 71 N., R.10 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine and fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

E—5 to 12 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; moderate medium platy structure parting to moderate thin platy; friable; few fine roots; common distinct silt coatings on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; clear smooth boundary.

BE—12 to 15 inches; grayish brown (10YR 5/2) silty clay loam, light gray (10YR 7/2) dry; weak medium platy structure parting to moderate very fine subangular blocky; friable; few fine roots; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds and in pores and few silt coatings on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; abrupt wavy boundary.

Btg1—15 to 25 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine prominent yellowish brown (10YR 5/4) mottles; strong fine and medium subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

Btg2—25 to 31 inches; dark grayish brown (2.5Y 4/2) silty clay; common fine prominent yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

Btg3—31 to 40 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine prominent strong brown (7.5YR 5/6) and common prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds and few distinct organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

Btg4—40 to 47 inches; light brownish gray (2.5Y 6/2) silty clay loam; few fine prominent strong brown (7.5YR 5/6) and common prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds and few distinct organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; slightly acid; gradual wavy boundary.

BCg—47 to 54 inches; light olive gray (5Y 6/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; friable; few fine roots; common distinct organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; neutral; gradual wavy boundary.

Cg—54 to 60 inches; light olive gray (5Y 6/2) silty clay loam; common medium prominent strong

brown (7.5YR 5/6) and yellowish brown (10YR 5/6) mottles; massive; friable; common distinct organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; neutral.

Range in Characteristics

Thickness of the solum: 42 to 60 inches

Ap or A horizon:

Hue—10YR

Value—3 or 4

Chroma—1 or 2

Texture—silt loam

E horizon:

Hue—10YR

Value—5 or 6

Chroma—2

Texture—silt loam

BE horizon:

Hue—10YR

Value—5 or 6

Chroma—2

Texture—silty clay loam

Btg horizon (upper part):

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—1 or 2

Texture—silty clay

Btg horizon (lower part):

Hue—2.5Y or 5Y

Value—5 or 6

Chroma—2

Texture—silty clay loam

BCg or Cg horizon:

Hue—2.5Y or 5Y

Value—5 or 6

Chroma—2

Texture—silty clay loam

260—Beckwith silt loam, 0 to 2 percent slopes

Composition

Beckwith and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Upland flats

Geomorphic component: Divides

Hillslope position: Summits

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Loess

Flooding: None

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 10.8 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Weller and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1260—Beckwith silt loam, bench, 0 to 2 percent slopes

Composition

Beckwith and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Loess

Flooding: None

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 10.8 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Weller and similar soils
- Belinda and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Belinda Series

Drainage class: Poorly drained

Permeability: Very slow

Landform: Upland flats and stream terraces

Parent material: Loess

Native vegetation: Mixed prairie grasses and deciduous trees

Slope range: 0 to 2 percent

Typical Pedon

Belinda silt loam, 0 to 2 percent slopes, 2,280 feet north and 13 feet west of the southeast corner of sec. 33, T. 71 N., R. 11 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine granular structure; friable; few fine roots; strongly acid; abrupt smooth boundary.

E—7 to 12 inches; dark gray (10YR 4/1) silt loam, light gray (10YR 6/1) dry; weak medium platy structure parting to weak very fine subangular blocky; friable; few fine roots; few prominent silt coatings on faces of peds; moderately acid; clear smooth boundary.

BE—12 to 15 inches; dark gray (10YR 4/1) silty clay loam; weak fine subangular blocky structure; friable; few fine roots; moderately acid; clear smooth boundary.

Btg1—15 to 23 inches; dark grayish brown (10YR 4/2) silty clay; common fine prominent yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; very firm; few fine roots; common prominent clay films on faces of peds; very strongly acid; clear smooth boundary.

Btg2—23 to 32 inches; grayish brown (10YR 5/2) silty clay; common fine prominent yellowish brown (10YR 5/6) and common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; very firm; few fine roots; common prominent clay films on faces of peds; few fine irregular soft masses of iron-manganese; very strongly acid; gradual smooth boundary.

Btg3—32 to 41 inches; grayish brown (10YR 5/2) silty clay; common fine distinct yellowish brown (10YR 5/4) and common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common prominent clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

BCg—41 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine and medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak medium and coarse subangular blocky structure; firm; few fine roots; very few prominent organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; strongly acid.

Range in Characteristics

Thickness of the solum: More than 60 inches

Ap horizon:

Hue—10YR

Value—3

Chroma—1

Texture—silt loam

E horizon:

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—1 or 2

Texture—silt loam

BE horizon:

Hue—10YR or 2.5Y

Value—4

Chroma—1 or 2

Texture—silty clay loam

Btg horizon:

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—1 or 2

Texture—silty clay

BCg horizon:

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—1 or 2

Texture—silty clay loam

130—Belinda silt loam, 0 to 2 percent slopes

Composition

Belinda and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Upland flats

Geomorphic component: Interfluves

Hillslope position: Summits

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Loess

Flooding: None

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 10.0 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Haig and similar soils
- Pershing and similar soils

Major Uses of the Unit

- Cropland
- Hayland

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1130—Belinda silt loam, bench, 0 to 2 percent slopes

Composition

Belinda and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Stream terraces
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Loess
Flooding: None
Seasonal high water table: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 10.0 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Pershing and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Bucknell Series

Drainage class: Somewhat poorly drained

Permeability: Slow

Landform: Uplands

Parent material: Thin mantle of loess or pedisegment and the underlying gray paleosol weathered from glacial till

Native vegetation: Mixed prairie grasses and deciduous trees

Slope range: 9 to 14 percent

Typical Pedon

Bucknell silty clay loam, 9 to 14 percent slopes, moderately eroded, 640 feet east and 1,100 feet south of the northwest corner of sec. 26, T. 71 N., R. 11 W.

- Ap—0 to 6 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; about 20 percent streaks and pockets of dark grayish brown (10YR 4/2) subsoil material; moderate medium subangular blocky structure parting to weak fine granular; friable; few fine roots; neutral; abrupt smooth boundary.
- Bt1—6 to 10 inches; dark grayish brown (10YR 4/2) clay; strong medium subangular blocky structure; firm; few fine roots; common faint clay films on faces of peds; few distinct silt coatings on faces of peds; common very dark grayish brown (10YR 3/2) organic coatings on faces of peds and in pores; moderately acid; clear smooth boundary.
- Bt2—10 to 16 inches; dark gray (10YR 4/1) and gray (10YR 5/1) clay; few fine prominent strong brown (7.5YR 5/6 and 5/8) and common medium yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; firm; few fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; 1 percent pebbles; moderately acid; gradual smooth boundary.
- Bt3—16 to 25 inches; mottled yellowish brown (10YR 5/4) and gray (10YR 5/1) clay; moderate medium subangular blocky structure; very firm; few fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; 1 percent pebbles; strongly acid; gradual wavy boundary.
- Bt4—25 to 32 inches; mottled yellowish brown (10YR 5/6) and gray (10YR 5/1) clay loam; moderate medium subangular blocky structure; very firm; few fine roots; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine irregular soft masses of iron-manganese; 1 percent pebbles; moderately acid; gradual smooth boundary.

Bt5—32 to 43 inches; mottled yellowish brown (10YR 5/6) and gray (10YR 5/1) clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine irregular soft masses of iron-manganese; 1 percent pebbles; moderately acid; gradual smooth boundary.

BC—43 to 50 inches; mottled yellowish brown (10YR 5/6) and gray (10YR 5/1) clay loam; weak medium and coarse prismatic structure; firm; few fine roots; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine irregular soft masses of iron-manganese; 1 percent pebbles; moderately acid; gradual smooth boundary.

C—50 to 60 inches; mottled strong brown (7.5YR 5/8), yellowish brown (10YR 5/6), and grayish brown (10YR 5/2) clay loam; massive; firm; few fine irregular soft masses of iron-manganese; 1 percent pebbles; neutral.

Range in Characteristics

Thickness of the solum: 40 to 60 inches

Ap or A horizon:

Hue—10YR
Value—2 to 4
Chroma—1 or 2
Texture—silty clay loam

E horizon (if it occurs):

Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam, loam, or silty clay loam

Bt horizon (upper part):

Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 to 8
Texture—clay

Bt horizon (lower part):

Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 to 8
Texture—clay loam

BC or C horizon:

Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 to 8
Texture—clay loam

423D2—Bucknell silty clay loam, 9 to 14 percent slopes, moderately eroded

Composition

Bucknell and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 9 to 14 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Pedisegment over gray paleosol weathered from glacial till

Flooding: None

Depth to the water table: 1 to 3 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 9.3 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Gara and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Cantril Series

Drainage class: Somewhat poorly drained

Permeability: Moderate

Landform: Upland drainageways

Parent material: Local alluvium and colluvium

Native vegetation: Mixed prairie grasses and deciduous trees

Slope range: 2 to 5 percent

Typical Pedon

Cantril silt loam, in an area of Nodaway-Coppock-Cantril complex, 2 to 5 percent slopes, 890 feet north and 168 feet east of the southwest corner of sec. 19, T. 72 N., R. 8 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; moderate fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

E—9 to 13 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; few fine prominent yellowish brown (10YR 5/8) mottles; weak very fine and fine subangular blocky structure; friable; few fine roots; common prominent light gray (10YR 7/2) silt coatings on faces of peds and in pores; many distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; strongly acid; clear smooth boundary.

Bt1—13 to 19 inches; dark grayish brown (10YR 4/2) clay loam; common fine prominent strong brown (7.5YR 5/8) mottles; moderate fine subangular blocky structure; firm; few fine roots; few faint clay films in root channels and pores; common prominent light gray (10YR 7/2) silt coatings on faces of peds and in pores; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; clear smooth boundary.

Bt2—19 to 30 inches; dark grayish brown (10YR 4/2) clay loam; common fine and medium prominent yellowish brown (10YR 5/8) and few fine faint gray (10YR 5/1) mottles; moderate fine subangular blocky structure; firm; few fine roots; few faint clay films in root channels and pores; few prominent light gray (10YR 7/2) silt coatings on faces of peds and in pores; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Bt3—30 to 43 inches; dark grayish brown (10YR 4/2) clay loam; many fine and medium prominent yellowish brown (10YR 5/8) and common fine faint gray (10YR 5/1) mottles; moderate fine subangular blocky structure; firm; few fine roots;

common distinct clay films on faces of peds; few light gray (10YR 7/2) silt coatings on faces of peds and in pores; very few prominent very dark gray (10YR 3/1) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

2C—43 to 60 inches; grayish brown (10YR 5/2) clay loam; many coarse prominent yellowish brown (10YR 5/6) and many fine and medium faint gray (10YR 5/1) mottles; massive; firm; few fine roots; few prominent very dark gray (10YR 3/1) organic coatings in root channels and pores; 7 percent pebbles; strongly acid.

Range in Characteristics

Thickness of the solum: 42 to 60 inches

Ap horizon:

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silt loam

E horizon:

Hue—10YR

Value—4 or 5

Chroma—2

Texture—loam or silt loam

Bt horizon:

Hue—10YR

Value—4 or 5

Chroma—2

Texture—clay loam

2C horizon:

Hue—10YR

Value—4 or 5

Chroma—2

Texture—clay loam

Chelsea Series

Drainage class: Excessively drained

Permeability: Rapid

Landform: Uplands

Parent material: Eolian sand

Native vegetation: Forest

Slope range: 5 to 25 percent

Typical Pedon

Chelsea loamy fine sand, in an area of Chelsea-Fayette complex, 18 to 25 percent slopes, 2,540 feet

north and 760 feet west of the southeast corner of sec. 12, T. 72 N., R. 8 W.

A1—0 to 2 inches; very dark gray (10YR 3/1) loamy fine sand, gray (10YR 5/1) dry; weak fine granular structure; very friable; few fine to coarse roots; slightly acid; abrupt smooth boundary.

A2—2 to 5 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; single grain; loose; few fine to coarse roots; moderately acid; clear smooth boundary.

E1—5 to 9 inches; dark grayish brown (10YR 4/2) loamy fine sand, light brownish gray (10YR 6/2) dry; single grain; loose; few fine to coarse roots; strongly acid; clear smooth boundary.

E2—9 to 16 inches; brown (10YR 4/3) fine sand, light brownish gray (10YR 6/2) dry; single grain; loose; few medium and coarse roots; strongly acid; clear smooth boundary.

E3—16 to 25 inches; dark yellowish brown (10YR 4/4) fine sand, light brownish gray (10YR 6/2) dry; single grain; loose; few fine and medium roots; strongly acid; clear smooth boundary.

E4—25 to 34 inches; yellowish brown (10YR 5/4) fine sand, very pale brown (10YR 7/3) dry; single grain; loose; few fine and medium roots; strongly acid; clear smooth boundary.

E and Bt—34 to 60 inches; yellowish brown (10YR 5/6) fine sand; single grain; loose; few fine and medium roots; common brown (7.5YR 4/4) lamellae of loamy sand $\frac{1}{2}$ inch to 2 inches thick; strongly acid.

Range in Characteristics

Thickness of the solum: 48 to more than 60 inches

Special features: Sand is dominantly fine textured.

Material as coarse as gravel is lacking to a depth of 40 inches or more.

A horizon:

Hue—10YR

Value—3 or 4

Chroma—1 to 4

Texture—loamy fine sand

E horizon:

Hue—10YR

Value—4 to 6

Chroma—2 to 4

Texture—fine sand or loamy fine sand

E and Bt horizon (E part):

Hue—10YR

Value—4 to 6

Chroma—3 to 6

Texture—fine sand

E and Bt horizon (Bt part):

Total thickness—less than 6 inches in the upper 60 inches of the soil

Hue—7.5YR or 10YR

Value—3 or 4

Chroma—3 or 4

Texture—sandy loam or loamy sand

293C—Chelsea-Fayette complex, 5 to 9 percent slopes

Composition

Chelsea and similar soils: About 70 percent

Fayette and similar soils: About 25 percent

Inclusions: About 5 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes and shoulders

Slope: 5 to 9 percent

Component Description

Chelsea

Surface layer texture: Loamy fine sand

Depth to bedrock: Greater than 60 inches

Drainage class: Excessively drained

Dominant parent material: Eolian sand

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 4.5 inches (low)

Content of organic matter in the surface layer: About 0.7 percent (low)

Fayette

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is

available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Somewhat poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

293F—Chelsea-Fayette complex, 18 to 25 percent slopes

Composition

Chelsea and similar soils: About 70 percent

Fayette and similar soils: About 25 percent

Inclusions: About 5 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 18 to 25 percent

Component Description

Chelsea

Surface layer texture: Loamy fine sand

Depth to bedrock: Greater than 60 inches

Drainage class: Excessively drained

Dominant parent material: Eolian sand

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 4.5 inches (low)

Content of organic matter in the surface layer: About 0.7 percent (low)

Fayette

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Somewhat poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Chequest Series

Drainage class: Poorly drained

Permeability: Moderately slow

Landform: Flood plains

Parent material: Silty alluvium

Native vegetation: Mixed grasses and deciduous trees

Slope range: 0 to 2 percent

Typical Pedon

Chequest silty clay loam, 0 to 2 percent slopes, 1,600 feet south and 900 feet west of the northeast corner of sec. 1, T. 72 N., R. 8 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; strong fine subangular blocky structure; firm; few fine roots; neutral; abrupt smooth boundary.

A—10 to 17 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; few fine prominent brown (7.5YR 4/4) mottles; strong medium subangular blocky structure; firm; few fine roots; very few prominent white (10YR 8/1) silt coatings on faces of peds; slightly acid; gradual smooth boundary.

Btg1—17 to 23 inches; dark gray (10YR 4/1) silty clay loam; few fine prominent brown (7.5YR 4/4)

mottles; strong medium subangular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; moderately acid; gradual smooth boundary.

Btg2—23 to 30 inches; dark gray (10YR 4/1) silty clay loam; few fine prominent brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; common distinct very dark gray (10YR 3/1) organic coatings in root channels and pores; few fine and medium irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

Btg3—30 to 40 inches; gray (5Y 5/1) silty clay loam; few fine and medium prominent brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds; common distinct very dark gray (10YR 3/1) organic coatings in root channels and pores; few fine and medium irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

Btg4—40 to 54 inches; light gray (5Y 6/1) silty clay loam; few fine and medium prominent brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; few fine roots; a coarse (2 inches in diameter) very dark gray (10YR 3/1) silty clay loam tubular channel fill (krotovina); few distinct clay films in root channels and pores; slightly acid; gradual smooth boundary.

Cg—54 to 60 inches; mottled light gray (5Y 6/1) and strong brown (7.5YR 4/6) silt loam; massive; friable; few fine roots; slightly acid.

Range in Characteristics

Thickness of the solum: 42 to 60 inches

Thickness of the mollic epipedon: 10 to 18 inches

A horizon:

Hue—10YR

Value—2 or 3

Chroma—1

Texture—silty clay loam

Btg horizon:

Hue—10YR, 2.5Y, or 5Y

Value—4 to 6

Chroma—1

Texture—silty clay loam or silty clay

Cg horizon:

Hue—7.5YR to 5Y

Value—4 to 6

Chroma—1 to 6

Texture—silt loam

587—Chequest silty clay loam, 0 to 2 percent slopes

Composition

Chequest and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Silty alluvium

Frequency of flooding: Occasional

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 10.1 inches (high)

Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Vesser and similar soils
- Lighter colored overwash areas

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Clarinda Series

Drainage class: Poorly drained

Permeability: Very slow

Landform: Uplands

Parent material: Loess over gray paleosol weathered from glacial till

Native vegetation: Prairie

Slope range: 5 to 9 percent

Taxadjunct features: The Clarinda soil in map unit 222C2 does not have a mollic epipedon.

Typical Pedon

Clarinda silty clay loam, 5 to 9 percent slopes, 700 feet south and 1,800 feet west of the northeast corner of sec. 21, T. 73 N., R. 11 W.

Ap—0 to 5 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A—5 to 12 inches; very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 5/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots; neutral; clear smooth boundary.

2Btg1—12 to 21 inches; dark gray (10YR 4/1) silty clay; moderate fine subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds and in pores; common very dark gray (10YR 3/1) organic coatings on faces of peds; few fine irregular soft masses of iron-manganese; slightly acid; clear smooth boundary.

2Btg2—21 to 32 inches; dark gray (5Y 4/1) silty clay; many fine prominent strong brown (7.5YR 5/6) and few fine prominent yellowish red (5YR 5/8) mottles; moderate fine subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds and in pores; few fine irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

2Btg3—32 to 41 inches; gray (5Y 5/1) silty clay; many fine prominent strong brown (7.5YR 5/6) and common fine prominent yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds and in pores; few fine irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

2Btg4—41 to 60 inches; gray (5Y 5/1) silty clay; common fine prominent yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds and in pores; few fine irregular soft masses of iron-manganese; slightly acid.

Range in Characteristics

Thickness of the solum: 60 inches or more

Thickness of the mollic epipedon: 10 to 18 inches

Ap or A horizon:

Hue—10YR

Value—2 or 3

Chroma—1

Texture—silty clay loam

2Btg horizon:

Hue—10YR, 2.5Y, or 5Y

Value—4 or 5

Chroma—1

Texture—silty clay or clay

222C—Clarinda silty clay loam, 5 to 9 percent slopes

Composition

Clarinda and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Loess over gray paleosol weathered from glacial till

Flooding: None

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 9.4 inches (high)

Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Adair and similar soils
- Shelby and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

222C2—Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded

Composition

Clarinda and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Loess over gray paleosol weathered from glacial till

Flooding: None

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 9.3 inches (high)

Content of organic matter in the surface layer: About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Adair and similar soils
- Shelby and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland

- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Clinton Series

Drainage class: Moderately well drained

Permeability: Moderately slow

Landform: Uplands and stream terraces

Parent material: Loess and loess over residuum

Native vegetation: Forest

Slope range: 2 to 14 percent

Typical Pedon

Clinton silt loam, 2 to 5 percent slopes, 1,730 feet north and 130 feet west of the southeast corner of sec. 27, T. 73 N., R. 9 W.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; few mixings of yellowish brown (10YR 5/4) in the lower part; weak thin platy structure parting to weak very fine and fine granular; friable; few fine roots; neutral; abrupt smooth boundary.

E—6 to 10 inches; yellowish brown (10YR 5/4) silt loam; weak thin platy structure parting to weak very fine subangular blocky; friable; few fine roots; very few distinct silt coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—10 to 14 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak fine subangular blocky structure, platy in the upper part; firm; few fine roots; many prominent clay films on faces of peds and in pores; few faint silt coatings on faces of peds; few fine irregular soft masses of iron-manganese; slightly acid; clear smooth boundary.

Bt2—14 to 22 inches; dark yellowish brown (10YR 4/4) silty clay loam; strong fine and medium subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds; many distinct light gray (10YR 7/2) silt coatings in root channels and pores; few fine irregular soft masses of iron-manganese; strongly acid; clear smooth boundary.

Bt3—22 to 32 inches; yellowish brown (10YR 5/4) silty clay; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Bt4—32 to 44 inches; brown (10YR 5/3) silty clay

loam; many fine and medium distinct yellowish brown (10YR 5/6) and many fine faint light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; many prominent clay films on faces of pedis; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

Bt5—44 to 55 inches; light brownish gray (10YR 6/2) silty clay loam; common fine and medium prominent strong brown (7.5YR 4/6) and common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; firm; few fine roots; common distinct clay films on faces of pedis; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

Bt6—55 to 60 inches; light brownish gray (10YR 6/2) silty clay loam; common fine and medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak medium and coarse subangular blocky structure; friable; few faint clay films on faces of pedis; moderately acid.

Range in Characteristics

Thickness of the solum: 42 to more than 60 inches

Ap horizon:

Hue—10YR
Value—4
Chroma—2 or 3
Texture—silt loam

E horizon (if it occurs):

Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—silt loam

Bt horizon (upper part):

Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam or silty clay

Bt horizon (lower part):

Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—silty clay loam or silty clay

80B—Clinton silt loam, 2 to 5 percent slopes

Composition

Clinton and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Interfluvies, side slopes, head slopes, and nose slopes

Hillslope position: Summits and shoulders

Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 4 to 6 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.4 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a lighter colored surface layer
- Somewhat poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

80C2—Clinton silty clay loam, 5 to 9 percent slopes, moderately eroded

Composition

Clinton and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, side slopes, and interfluvies
Hillslope position: Shoulders, backslopes, and summits
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: 4 to 6 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.2 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ashgrove and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

80D2—Clinton silty clay loam, 9 to 14 percent slopes, moderately eroded

Composition

Clinton and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: 4 to 6 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.2 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ashgrove and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

880B—Clinton silt loam, bench, 2 to 5 percent slopes***Composition***

Clinton and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Stream terraces
Geomorphic component: Side slopes
Hillslope position: Summits, shoulders, and backslopes
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: 4 to 6 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.4 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Keomah and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

880C2—Clinton silty clay loam, bench, 5 to 9 percent slopes, moderately eroded***Composition***

Clinton and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Stream terraces
Geomorphic component: Side slopes
Hillslope position: Backslopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: 4 to 6 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.4 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a sandy and gravelly subsoil
- Galland and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

880D2—Clinton silty clay loam, bench, 9 to 14 percent slopes, moderately eroded

Composition

Clinton and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Stream terraces
Geomorphic component: Side slopes
Hillslope position: Backslopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Loess over residuum
Flooding: None
Depth to the water table: 4 to 6 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.4 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a sandy and gravelly subsoil
- Galland and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Colo Series

Drainage class: Poorly drained
Permeability: Moderate

Landform: Upland drainageways
Parent material: Local alluvium
Native vegetation: Prairie
Slope range: 0 to 5 percent

Typical Pedon

Colo silty clay loam, in an area of Colo-Zook complex, 0 to 5 percent slopes, 1,520 feet east and 135 feet north of the southwest corner of sec. 6, T. 73 N., R. 11 W.

- Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; few fine roots; neutral; abrupt smooth boundary.
- A1—9 to 22 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine and medium subangular blocky structure; friable; few fine roots; slightly acid; gradual smooth boundary.
- A2—22 to 39 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium prismatic structure parting to weak fine subangular blocky; firm; few fine roots; slightly acid; gradual smooth boundary.
- Bw—39 to 52 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; few fine prominent yellowish brown (10YR 5/4 and 5/6) mottles; weak medium prismatic structure parting to weak fine subangular blocky; firm; few fine roots; moderately acid; gradual smooth boundary.
- Cg—52 to 60 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent yellowish brown (10YR 5/6 and 5/8) and many fine distinct brown (10YR 5/3) mottles; massive; firm; few fine irregular soft masses of iron-manganese; slightly acid.

Range in Characteristics

Thickness of the solum: 42 to 60 inches
Thickness of the mollic epipedon: 36 to 48 inches

A horizon:

Hue—10YR to 5Y or neutral
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam

Bg horizon:

Hue—10YR
Value—2 or 3
Chroma—1
Texture—silty clay loam

Cg horizon:

Hue—10YR to 5Y
Value—3 to 5

Chroma—1 or 2
Texture—silty clay loam

87B—Colo-Zook complex, 0 to 5 percent slopes

Composition

Colo and similar soils: About 68 percent
Zook and similar soils: About 22 percent
Inclusions: About 10 percent

Setting

Landform: Upland drainageways
Geomorphic component: Base slopes
Hillslope position: Footslopes and toeslopes
Slope: 0 to 5 percent

Component Description

Colo

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Local alluvium
Flooding: None
Seasonal high water table: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.1 inches (high)
Content of organic matter in the surface layer: About 6 percent (high)

Zook

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Local alluvium
Flooding: None
Seasonal high water table: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 9.0 inches (high)
Content of organic matter in the surface layer: About 6 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Clarinda and similar soils
- Soils that have a subsoil of silt loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Coppock Series

Drainage class: Somewhat poorly drained or poorly drained

Permeability: Moderate

Landform: Flood plains and drainageways

Parent material: Silty alluvium

Native vegetation: Mixed grasses and deciduous trees

Slope range: 0 to 5 percent

Typical Pedon

Coppock silt loam, 0 to 2 percent slopes, 2,400 feet east and 880 feet south of the northwest corner of sec. 31, T. 72 N., R. 10 W.

- Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.
- E1—9 to 17 inches; grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) dry; few fine faint brown (10YR 5/3) mottles; weak medium platy structure; friable; few fine roots; common prominent white (10YR 8/1) silt coatings on horizontal faces of pedis; few fine and medium irregular soft masses of iron-manganese; neutral; gradual smooth boundary.
- E2—17 to 24 inches; light brownish gray (10YR 6/2) silt loam, light gray (10YR 7/2) dry; few fine prominent strong brown (7.5YR 5/8) mottles; weak thick platy structure; friable; few fine roots; common prominent white (10YR 8/1) silt coatings on horizontal faces of pedis; few fine and medium irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.
- E3—24 to 29 inches; light brownish gray (10YR 6/2) silt loam; few fine prominent strong brown (7.5YR 5/8) mottles; weak thick platy structure; friable; few fine roots; common prominent white (10YR

8/1) silt coatings on horizontal faces of peds; moderately acid; clear smooth boundary.

Btg1—29 to 34 inches; grayish brown (10YR 5/2) silty clay loam; few fine prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; many distinct clay films on faces of peds; very few prominent white (10YR 8/1) silt coatings on faces of peds and in pores; few fine and medium irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Btg2—34 to 40 inches; grayish brown (10YR 5/2) silty clay loam; few fine prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; many distinct clay films on faces of peds; few fine and medium irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Btg3—40 to 45 inches; grayish brown (10YR 5/2) silty clay loam; few fine prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; few fine and medium irregular soft masses of iron-manganese; very strongly acid; gradual smooth boundary.

Btg4—45 to 53 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine and medium prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; firm; common distinct clay films on faces of peds; few fine and medium irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Btg5—53 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine and medium prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; firm; few distinct clay films on faces of peds; few fine and medium irregular soft masses of iron-manganese; strongly acid.

Range in Characteristics

Thickness of the solum: 40 to more than 60 inches

Ap horizon:

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silt loam

E horizon:

Hue—10YR

Value—4 to 6

Chroma—1 or 2

Texture—silt loam

Btg horizon:

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—1 or 2

Texture—silty clay loam

520—Coppock silt loam, 0 to 2 percent slopes

Composition

Coppock and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Silty alluvium

Frequency of flooding: Occasional

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)

Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a subsoil of silty clay

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

520B—Coppock silt loam, 2 to 5 percent slopes

Composition

Coppock and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Alluvial fans
Geomorphic component: Base slopes
Hillslope position: Footslopes
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium
Flooding: None
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a subsoil of silty clay

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Douds Series

Drainage class: Moderately well drained
Permeability: Moderate in the upper part and moderately rapid in the lower part
Landform: Stream terraces

Parent material: Old valley alluvium derived from glaciers

Native vegetation: Forest

Slope range: 9 to 18 percent

Typical Pedon

Douds loam, in an area of Galland-Douds complex, 9 to 14 percent slopes, moderately eroded, 1,120 feet north and 2,380 feet east of the southwest corner of sec. 6, T. 71 N., R. 11 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; about 30 percent streaks and pockets of dark yellowish brown (10YR 4/4) subsoil material; moderate fine granular structure; friable; few fine roots; many distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; moderately acid; abrupt smooth boundary.

Bt1—8 to 15 inches; dark yellowish brown (10YR 4/4) sandy clay loam; few fine and medium prominent strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable; few fine roots; few faint clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—15 to 33 inches; strong brown (7.5YR 4/6) sandy clay loam; common fine and medium prominent yellowish red (5YR 4/6) and very few fine prominent light brownish gray (2.5Y 6/2) mottles; moderate fine subangular blocky structure; firm; few fine roots; thin strata of yellowish brown (10YR 5/4) loamy sand in the lower part; common faint clay films on faces of peds; strongly acid; gradual smooth boundary.

BC—33 to 43 inches; stratified, yellowish brown (10YR 5/6) sandy loam, loamy sand, and loam; few fine prominent yellowish red (5YR 4/6) and distinct strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; firm; few fine roots; strongly acid; gradual smooth boundary.

C—43 to 60 inches; strong brown (7.5YR 4/6) sandy loam; many fine distinct yellowish red (5YR 4/6) and common yellowish red (5YR 5/6) mottles; firm; many thick strata of yellowish brown (10YR 5/4) loamy sand; moderately acid.

Range in Characteristics

Thickness of the solum: 36 to 60 inches

Ap horizon:

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—loam

Bt horizon:

Hue—10YR or 7.5YR

Value—4 or 5

Chroma—4 to 8

Texture—loam, clay loam, or sandy clay loam

BC or C horizon:

Hue—10YR or 7.5YR

Value—4 or 5

Chroma—4 to 8

Texture—stratified sandy loam, loamy sand, loam, clay loam, or sandy clay loam

Edina Series*Drainage class:* Poorly drained*Permeability:* Very slow*Landform:* Upland depressions*Parent material:* Loess*Native vegetation:* Prairie*Slope range:* 0 to 1 percent**Typical Pedon**

Edina silt loam, depressional, 0 to 1 percent slopes, 620 feet south and 240 feet west of the center of sec. 12, T. 71 N., R. 11 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

E—9 to 16 inches; dark gray (10YR 4/1) silt loam, gray (10YR 5/1) dry; moderate medium platy structure parting to weak very fine subangular blocky; friable; few fine roots; many distinct very dark gray (10YR 3/1) organic coatings on faces of peds and in pores; moderately acid; clear smooth boundary.

Bt—16 to 25 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; common fine prominent yellowish brown (10YR 5/6) mottles; moderate very fine and fine angular blocky structure; very firm; few fine roots; many distinct clay films on faces of peds; many black (10YR 2/1) organic coatings on faces of peds and in pores; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

Btg1—25 to 37 inches; grayish brown (10YR 5/2) silty clay; common fine and medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate fine and medium angular blocky structure; very firm; few fine roots; many clay

films on faces of peds; common distinct dark gray (10YR 4/1) organic coatings on faces of peds and in pores; few fine irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

Btg2—37 to 47 inches; grayish brown (10YR 5/2) silty clay loam; few fine and medium prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; very firm; few fine roots; common distinct clay films on faces of peds; very few prominent very dark gray (10YR 3/1) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

BCg—47 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; many prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; few fine roots; very few prominent very dark gray (10YR 3/1) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; slightly acid.

Range in Characteristics*Thickness of the solum:* 40 to more than 60 inches*Thickness of the mollic epipedon:* 10 to 14 inches*Ap horizon:*

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam

E horizon:

Hue—10YR

Value—4 or 5

Chroma—1 or 2

Texture—silt loam

Bt horizon:

Hue—10YR or 2.5Y

Value—2 or 3

Chroma—1

Texture—silty clay or silty clay loam

Btg horizon:

Hue—10YR to 5Y

Value—3 to 5

Chroma—1 or 2

Texture—silty clay or silty clay loam

BCg horizon:

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—1 or 2

Texture—silty clay loam

211—Edina silt loam, depressional, 0 to 1 percent slopes

Composition

Edina and similar soils: 100 percent

Setting

Landform: Upland depressions

Geomorphic component: Divides

Hillslope position: Summits

Slope: 0 to 1 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Loess

Flooding: None

Seasonal high water table: 0.5 foot above to 1.0 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 9.7 inches (high)

Content of organic matter in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Fayette Series

Drainage class: Well drained

Permeability: Moderate

Landform: Uplands

Parent material: Loess

Native vegetation: Forest

Slope range: 5 to 25 percent

Typical Pedon

Fayette silt loam, in an area of Chelsea-Fayette complex, 5 to 9 percent slopes, 78 feet west and 430

feet north of the southeast corner of sec. 1, T. 72 N., R. 8 W.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; weak fine granular structure; friable; few fine roots; strongly acid; abrupt smooth boundary.

E—6 to 10 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; weak medium platy structure parting to weak very fine subangular blocky; friable; few fine roots; common prominent light gray (10YR 7/2) silt coatings on faces of peds; moderately acid; clear smooth boundary.

BE—10 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; common prominent light gray (10YR 7/2) silt coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—15 to 28 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; few fine roots; many faint brown (10YR 4/3) clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt2—28 to 37 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many distinct brown (10YR 4/3) clay films on faces of peds; moderately acid; gradual smooth boundary.

Bt3—37 to 46 inches; yellowish brown (10YR 5/4) silty clay loam; common fine prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; common distinct brown (10YR 4/3) clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

Bt4—46 to 57 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium subangular blocky structure; friable; few fine roots; common distinct brown (10YR 4/3) clay films on faces of peds; few prominent light brownish gray (10YR 6/2) silt coatings in root channels and pores; few fine irregular soft masses of iron-manganese; moderately acid; gradual wavy boundary.

C—57 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; few fine irregular soft masses of iron-manganese; slightly acid.

Range in Characteristics

Thickness of the solum: 36 to 60 inches

Ap horizon:

Hue—10YR
Value—4
Chroma—2 or 3
Texture—silt loam

E horizon:

Hue—10YR
Value—4 or 5
Chroma—1 to 4
Texture—silt loam

Bt horizon:

Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—silty clay loam

C horizon:

Hue—10YR
Value—4 or 5
Chroma—4
Texture—silt loam or silty clay loam

Galland Series

Drainage class: Somewhat poorly drained

Permeability: Slow

Landform: Stream terraces

Parent material: Reddish paleosol weathered from old valley alluvium derived from glaciers

Native vegetation: Forest

Slope range: 9 to 18 percent

Typical Pedon

Galland clay loam, 9 to 14 percent slopes, moderately eroded, 210 feet south and 1,120 feet east of the center of sec. 18, T. 73 N., R. 9 W.

Ap—0 to 7 inches; brown (10YR 4/3) clay loam, light brownish gray (10YR 6/2) dry; about 20 percent streaks and pockets of yellowish brown (10YR 5/4) subsoil material; weak fine granular structure; friable; few fine roots; strongly acid; abrupt smooth boundary.

Bt1—7 to 17 inches; yellowish brown (10YR 5/4) clay loam; few fine prominent red (2.5YR 4/6) mottles; moderate fine angular blocky structure; firm; few fine roots; few distinct clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—17 to 28 inches; brown (7.5YR 5/4) clay; few fine prominent grayish brown (10YR 5/2), few fine prominent yellowish brown (10YR 5/6), and many fine prominent red (2.5YR 4/6) mottles; strong medium and coarse angular blocky structure; firm; few fine roots; many prominent reddish

brown (5YR 4/3) clay films on faces of peds; few fine irregular soft masses of iron-manganese; very strongly acid; gradual smooth boundary.

Bt3—28 to 37 inches; brown (7.5YR 5/4) clay; few fine prominent dark gray (10YR 4/1), few fine prominent yellowish brown (10YR 5/6), common fine and medium distinct brown (10YR 5/3), and few fine prominent red (2.5YR 4/6) mottles; strong medium and coarse subangular blocky structure; firm; few fine roots; many prominent dark brown (7.5YR 4/4) clay films on faces of peds; few fine irregular soft masses of iron-manganese; very strongly acid; gradual smooth boundary.

Bt4—37 to 48 inches; yellowish brown (10YR 5/6) clay loam; common fine and medium distinct brown (10YR 5/3) and common fine prominent yellowish red (5YR 4/6) mottles; moderate coarse subangular blocky structure; firm; few fine roots; many prominent dark brown (7.5YR 4/4) clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Bt5—48 to 54 inches; yellowish brown (10YR 5/6) clay loam; common fine and medium distinct brown (10YR 5/3) and common fine prominent yellowish brown (10YR 5/8) mottles; moderate coarse subangular blocky structure; firm; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

BC—54 to 60 inches; mottled strong brown (7.5YR 5/6) and light brownish gray (2.5Y 6/2) loam; common fine prominent reddish brown (5YR 5/3) and common medium prominent grayish brown (2.5Y 5/2) mottles; weak coarse subangular blocky structure; firm; few fine irregular soft masses of iron-manganese; slightly acid.

Range in Characteristics

Thickness of the solum: 36 to more than 60 inches

Ap horizon:

Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—loam

E horizon:

Hue—7.5YR or 10YR
Value—4 or 5
Chroma—2 or 3
Texture—loam or clay loam

Bt horizon:

Hue—5YR to 10YR

Value—3 to 5

Chroma—2 to 6

Texture—clay, clay loam, or silty clay

BC horizon:

Hue—7.5YR to 2.5Y

Value—4 to 6

Chroma—2 to 8

Texture—loam or clay loam

594D2—Galland clay loam, 9 to 14 percent slopes, moderately eroded**Composition**

Galland and similar soils: About 90 percent

Inclusions: About 10 percent

Setting*Landform:* Stream terraces*Geomorphic component:* Side slopes*Hillslope position:* Backslopes*Slope:* 9 to 14 percent**Component Description***Surface layer texture:* Clay loam*Depth to bedrock:* Greater than 60 inches*Drainage class:* Somewhat poorly drained*Dominant parent material:* Reddish paleosol weathered from old valley alluvium*Flooding:* None*Depth to the water table:* 1 to 3 feet*Kind of water table:* Perched*Available water capacity to 60 inches or root-limiting layer:* About 9.9 inches (high)*Content of organic matter in the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Douds and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

994D2—Galland-Douds complex, 9 to 14 percent slopes, moderately eroded**Composition**

Galland and similar soils: About 70 percent

Douds and similar soils: About 25 percent

Inclusions: About 5 percent

Setting*Landform:* Stream terraces*Geomorphic component:* Side slopes*Hillslope position:* Backslopes*Slope:* 9 to 14 percent**Component Description****Galland***Surface layer texture:* Loam*Depth to bedrock:* Greater than 60 inches*Drainage class:* Somewhat poorly drained*Dominant parent material:* Reddish paleosol weathered from old valley alluvium*Flooding:* None*Depth to the water table:* 1 to 3 feet*Kind of water table:* Perched*Available water capacity to 60 inches or root-limiting layer:* About 9.9 inches (high)*Content of organic matter in the surface layer:* About 2 percent (moderate)**Douds***Surface layer texture:* Loam*Depth to bedrock:* Greater than 60 inches*Drainage class:* Moderately well drained*Dominant parent material:* Old valley alluvium derived from glaciers*Flooding:* None*Depth to the water table:* 4 to 6 feet*Kind of water table:* Apparent*Available water capacity to 60 inches or root-limiting layer:* About 8.7 inches (moderate)*Content of organic matter in the surface layer:* About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this

map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

994E2—Galland-Douds complex, 14 to 18 percent slopes, moderately eroded

Composition

Galland and similar soils: About 55 percent

Douds and similar soils: About 40 percent

Inclusions: About 5 percent

Setting

Landform: Stream terraces

Geomorphic component: Side slopes

Hillslope position: Backslopes

Slope: 14 to 18 percent

Component Description

Galland

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Reddish paleosol weathered from old valley alluvium

Flooding: None

Depth to the water table: 1 to 3 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 10.0 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

Douds

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Old valley alluvium derived from glaciers

Flooding: None

Depth to the water table: 4 to 6 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 8.7 inches (moderate)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of severely eroded soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Gara Series

Drainage class: Well drained

Permeability: Moderately slow

Landform: Uplands

Parent material: Glacial till

Native vegetation: Mixed prairie grasses and deciduous trees

Slope range: 9 to 18 percent

Typical Pedon

Gara clay loam, 9 to 14 percent slopes, moderately eroded, 340 feet east and 1,900 feet south of the center of sec. 35, T. 71 N., R. 11 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) clay loam, grayish brown (2.5Y 5/2) dry; about 20 percent streaks and pockets of brown (10YR 4/3) subsoil material; weak fine granular structure; friable; few fine roots; few distinct white (10YR 8/1) silt coatings on faces of peds and in pores; moderately acid; abrupt smooth boundary.

Bt1—7 to 14 inches; brown (10YR 4/3) clay loam; weak fine subangular blocky structure; friable;

few fine roots between peds; few very dark gray (10YR 3/1) and dark gray (10YR 4/1) organic coatings on faces of peds; few fine pebbles; strongly acid; clear smooth boundary.

Bt2—14 to 24 inches; dark yellowish brown (10YR 4/4) clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure parting to moderate fine subangular blocky; firm; few fine roots between peds; common distinct clay films on faces of peds and in pores; few fine pebbles; very strongly acid; gradual smooth boundary.

Bt3—24 to 42 inches; yellowish brown (10YR 5/4) clay loam; common fine and medium distinct yellowish brown (10YR 5/6) and common fine prominent strong brown (7.5YR 5/8) mottles; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; firm; few fine roots between peds; common distinct clay films on faces of peds and in pores; few fine irregular soft masses of iron-manganese; few fine pebbles; strongly acid; gradual smooth boundary.

BC—42 to 47 inches; yellowish brown (10YR 5/4) clay loam; common fine and medium distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few fine irregular soft masses of iron-manganese; few fine pebbles; strongly acid; gradual smooth boundary.

C—47 to 60 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; massive; firm; few fine irregular soft masses of iron-manganese; few fine irregular soft masses of carbonate; few fine pebbles; neutral.

Range in Characteristics

Thickness of the solum: 30 to 60 inches

Depth to carbonates: 30 to 60 inches

Content of coarse fragments: 0 to 5 percent fine pebbles below a depth of 7 inches

Ap horizon:

Hue—10YR

Value—3

Chroma—1 or 2

Texture—loam

Bt horizon:

Hue—10YR or 7.5YR

Value—4 or 5

Chroma—3 to 6

Texture—clay loam

BC or C horizon:

Hue—10YR

Value—4 or 5

Chroma—4 to 6

Texture—clay loam

179D2—Gara clay loam, 9 to 14 percent slopes, moderately eroded

Composition

Gara and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 9 to 14 percent

Component Description

Surface layer texture: Clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Well drained

Dominant parent material: Glacial till

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 10.2 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Armstrong and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

179E2—Gara clay loam, 14 to 18 percent slopes, moderately eroded

Composition

Gara and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 14 to 18 percent

Component Description

Surface layer texture: Clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Well drained

Dominant parent material: Glacial till

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 10.2 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Armstrong and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

993D2—Gara-Armstrong complex, 9 to 14 percent slopes, moderately eroded

Composition

Gara and similar soils: About 50 percent

Armstrong and similar soils: About 45 percent

Inclusions: About 5 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 9 to 14 percent

Component Description

Gara

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Well drained

Dominant parent material: Glacial till

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 10.2 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

Armstrong

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Pedisements over reddish paleosol weathered from glacial till

Flooding: None

Depth to the water table: 1 to 3 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 8.6 inches (moderate)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bucknell and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

993E2—Gara-Armstrong complex, 14 to 18 percent slopes, moderately eroded

Composition

Gara and similar soils: About 50 percent
 Armstrong and similar soils: About 45 percent
 Inclusions: About 5 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 14 to 18 percent

Component Description

Gara

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Well drained

Dominant parent material: Glacial till

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 10.2 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

Armstrong

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Pedisements over reddish paleosol weathered from glacial till

Flooding: None

Depth to the water table: 1 to 3 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 8.5 inches (moderate)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bucknell and similar soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Givin Series

Drainage class: Somewhat poorly drained

Permeability: Moderately slow

Landform: Upland flats and stream terraces

Parent material: Loess

Native vegetation: Mixed prairie grasses and deciduous trees

Slope range: 0 to 5 percent

Typical Pedon

Givin silt loam, 0 to 2 percent slopes, 700 feet south and 540 feet east of the northwest corner of sec. 21, T. 73 N., R. 8 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

E—9 to 14 inches; grayish brown (10YR 5/2) silt loam; few fine distinct yellowish brown (10YR 5/4) mottles; weak thick platy structure parting to moderate thin platy; friable; few fine roots; many prominent light gray (10YR 7/2) silt coatings on horizontal faces of peds; neutral; clear smooth boundary.

BE—14 to 17 inches; brown (10YR 5/3) and grayish brown (10YR 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; weak thick platy structure parting to moderate fine subangular blocky; friable; few fine roots; common prominent light gray (10YR 7/2) silt coatings on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

Bt1—17 to 24 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine prominent yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; few faint clay films on faces of peds;

few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Bt2—24 to 31 inches; grayish brown (2.5Y 5/2) silty clay loam; few fine prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Bt3—31 to 41 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

BC—41 to 53 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine and medium prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; few fine roots; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

C—53 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine and medium prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) mottles; massive; friable; strongly acid (pH 5.2).

Range in Characteristics

Thickness of the solum: 40 to 60 inches

Ap horizon:

Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silt loam

E horizon:

Hue—10YR
Value—4 or 5
Chroma—2
Texture—silt loam

Bt horizon:

Hue—10YR or 2.5Y
Value—4 or 5
Chroma—2 or 3
Texture—silty clay loam or silty clay

BC or C horizon:

Hue—2.5Y or 5Y

Value—4 or 5

Chroma—2

Texture—silty clay loam

75—Givin silt loam, 0 to 2 percent slopes

Composition

Givin and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Upland flats

Geomorphic component: Divides

Hillslope position: Summits

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 12.0 inches (high)

Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Rubio and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

75B—Givin silt loam, 2 to 5 percent slopes**Composition**

Givin and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Upland flats

Geomorphic component: Interfluves

Hillslope position: Shoulders and summits

Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.8 inches (high)

Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Rubio and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1075B—Givin silt loam, bench, 2 to 5 percent slopes**Composition**

Givin and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Stream terraces

Geomorphic component: Side slopes

Hillslope position: Summits, shoulders, and backslopes

Slope: 1 to 5 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.8 inches (high)

Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Gosport Series

Drainage class: Moderately well drained

Permeability: Very slow

Landform: Uplands

Parent material: Residuum derived from shale

Native vegetation: Forest

Slope range: 14 to 40 percent

Typical Pedon

Gosport silty clay loam, 14 to 18 percent slopes, moderately eroded, 400 feet west and 2,050 feet

north of the southeast corner of sec. 19, T. 71 N., R. 10 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silty clay loam, yellowish brown (10YR 5/4) dry; about 40 percent streaks and pockets of yellowish brown (10YR 5/4) subsoil material; weak fine subangular blocky structure; friable; few fine roots; strongly acid; abrupt smooth boundary.

Bt—8 to 14 inches; yellowish brown (10YR 5/4) silty clay; few fine distinct strong brown (7.5YR 5/8) and few fine faint yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; few fine roots; very few faint clay films on faces of peds; few fine shale fragments; very strongly acid; clear smooth boundary.

Bw—14 to 22 inches; grayish brown (2.5Y 5/2), yellowish brown (10YR 5/8), and brownish yellow (10YR 6/6) silty clay; weak coarse subangular blocky structure; very firm; few fine roots; few fine shale fragments; very strongly acid; gradual smooth boundary.

Cr—22 inches; weathered clayey shale.

Range in Characteristics

Thickness of the solum: 20 to 40 inches

Depth to material weathered from shale: 3 to 15 inches

Depth to bedrock: 20 to 40 inches

Ap or A horizon:

Hue—10YR

Value—3 or 4

Chroma—1 or 2

Texture—silty clay loam

E horizon (if it occurs):

Hue—10YR

Value—4 or 5

Chroma—2 to 4

Texture—silt loam

Bt or Bw horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 or 6

Chroma—2 to 4

Texture—silty clay or clay

313E2—Gosport silty clay loam, 14 to 18 percent slopes, moderately eroded

Composition

Gosport and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 14 to 18 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: 20 to 40 inches

Drainage class: Moderately well drained

Dominant parent material: Residuum derived from shale

Flooding: None

Depth to the water table: 1.5 to 3.0 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 2.7 inches (very low)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas that have limestone bedrock at the surface

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

313G—Gosport silty clay loam, 25 to 40 percent slopes

Composition

Gosport and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 18 to 40 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: 20 to 40 inches

Drainage class: Moderately well drained

Dominant parent material: Residuum derived from shale

Flooding: None

Depth to the water table: 1.5 to 3.0 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 2.7 inches (very low)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas that have limestone bedrock at the surface

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Grundy Series

Drainage class: Somewhat poorly drained

Permeability: Slow

Landform: Uplands

Parent material: Loess

Native vegetation: Prairie

Slope range: 2 to 5 percent

Taxadjunct features: The Grundy soil in map unit 364B2 does not have a mollic epipedon.

Typical Pedon

Grundy silty clay loam, 2 to 5 percent slopes, 1,070 feet east and 87 feet south of the northwest corner of sec. 19, T. 71 N., R. 10 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine granular

structure; friable; few fine roots; moderately acid; abrupt smooth boundary.

A—8 to 15 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few fine roots; moderately acid; clear smooth boundary.

BA—15 to 19 inches; dark grayish brown (10YR 4/2) and very dark gray (10YR 3/1) silty clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; friable; few fine roots; strongly acid; clear smooth boundary.

Btg1—19 to 25 inches; dark grayish brown (10YR 4/2) silty clay; common fine distinct yellowish brown (10YR 5/4 and 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; many faint clay films on faces of peds; common faint very dark gray (10YR 3/1) organic coatings in root channels and pores; few distinct manganese or iron-manganese stains; strongly acid; gradual smooth boundary.

Btg2—25 to 33 inches; grayish brown (2.5Y 5/2) silty clay; few fine prominent light gray (10YR 6/1) and common fine prominent yellowish brown (10YR 5/4 and 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds; common faint very dark gray (10YR 3/1) organic coatings in root channels and pores; few distinct manganese or iron-manganese stains; strongly acid; gradual smooth boundary.

Btg3—33 to 42 inches; grayish brown (2.5Y 5/2) silty clay; few fine prominent strong brown (7.5YR 5/8) and common fine prominent yellowish brown (10YR 5/4 and 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many prominent clay films on faces of peds; common faint very dark gray (10YR 3/1) organic coatings in root channels and pores; few distinct manganese or iron-manganese stains; moderately acid; gradual smooth boundary.

Btg4—42 to 50 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/4 and 5/6) and strong brown (7.5YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common prominent clay films on faces of peds; common faint very dark gray (10YR 3/1) organic coatings in root channels and pores; few distinct manganese or iron-manganese stains; moderately acid; gradual smooth boundary.

Cg—50 to 60 inches; light gray (5Y 6/1) silty clay loam; many medium prominent strong brown (7.5YR 5/8) mottles; massive; firm; common faint very dark gray (10YR 3/1) organic coatings in root channels and pores; few distinct manganese or iron-manganese stains; moderately acid.

Range in Characteristics

Thickness of the solum: 40 to 60 inches

Thickness of the mollic epipedon: 11 to 24 inches

A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silty clay loam

BA horizon:

Hue—10YR

Value—3 or 4

Chroma—1 or 2

Texture—silty clay loam or silty clay

Btg horizon (upper part):

Hue—10YR or 2.5Y

Value—3 or 4

Chroma—1 to 3

Texture—silty clay

Btg horizon (lower part):

Hue—10YR to 5Y

Value—4 or 5

Chroma—1 or 2

Texture—silty clay or silty clay loam

Cg horizon:

Hue—10YR to 5Y

Value—4 to 6

Chroma—1 or 2

Texture—silty clay loam

364B—Grundy silty clay loam, 2 to 5 percent slopes

Composition

Grundy and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Uplands

Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes

Hillslope position: Shoulders and summits

Slope: 2 to 5 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 1.5 to 3.0 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 9.8 inches (high)

Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Haig and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

364B2—Grundy silty clay loam, 2 to 5 percent slopes, moderately eroded

Composition

Grundy and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Uplands

Geomorphic component: Interfluves, side slopes, head slopes, and nose slopes

Hillslope position: Shoulders and summits

Slope: 2 to 5 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 1.5 to 3.0 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 9.8 inches (high)

Content of organic matter in the surface layer: About 3.2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Haig and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Haig Series

Drainage class: Poorly drained

Permeability: Very slow

Landform: Upland flats

Parent material: Loess

Native vegetation: Prairie

Slope range: 0 to 2 percent

Typical Pedon

Haig silt loam, 0 to 2 percent slopes, 2,334 feet west and 120 feet north of the southeast corner of sec. 23, T. 71 N., R. 8 W.

Ap—0 to 6 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A1—6 to 12 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

A2—12 to 17 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

Bt—17 to 22 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; few fine

roots; common distinct black (10YR 2/1) clay films on faces of peds; moderately acid; clear smooth boundary.

Btg1—22 to 29 inches; dark gray (10YR 4/1) silty clay; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; very firm; few fine roots; many distinct clay films on faces of peds; many distinct very dark gray (10YR 3/1) organic coatings on faces of peds and in pores; strongly acid; gradual smooth boundary.

Btg2—29 to 36 inches; olive gray (5Y 5/2) silty clay; common fine prominent yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate fine prismatic; very firm; few fine roots; many distinct clay films on faces of peds; common distinct very dark gray (10YR 3/1) organic coatings on faces of peds and in pores; moderately acid; gradual smooth boundary.

Btg3—36 to 42 inches; olive gray (5Y 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; common distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

Btg4—42 to 50 inches; light olive gray (5Y 6/2) silty clay loam; common fine and medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

Btg5—50 to 60 inches; mottled light olive gray (5Y 6/2) and yellowish brown (10YR 5/8) silty clay loam; weak medium prismatic structure; friable; very few distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid.

Range in Characteristics

Thickness of the solum: 52 to more than 60 inches

Thickness of the mollic epipedon: 20 to 23 inches

Ap or A horizon:

Hue—10YR or neutral

Value—2 or 3

Chroma—0 or 1

Texture—silt loam or silty clay loam

Bt horizon:

Hue—10YR or 2.5Y

Value—3 or 4

Chroma—1

Texture—silty clay loam or silty clay

Btg horizon (upper part):

Hue—10YR or 2.5Y

Value—3 or 4

Chroma—1

Texture—silty clay

Btg horizon (lower part):

Hue—10YR to 5Y

Value—4 to 6

Chroma—1 or 2

Texture—silty clay or silty clay loam

362—Haig silt loam, 0 to 2 percent slopes

Composition

Haig and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Upland flats

Geomorphic component: Divides

Hillslope position: Summits

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Loess

Flooding: None

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.0 inches (high)

Content of organic matter in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Edina and similar soils

Major Uses of the Unit

- Cropland
- Hayland

- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

363—Haig silty clay loam, 0 to 1 percent slopes

Composition

Haig and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Upland flats

Geomorphic component: Divides

Hillslope position: Summits

Slope: 0 to 1 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Loess

Flooding: None

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 10.9 inches (high)

Content of organic matter in the surface layer: About 4.5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Edina and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Hedrick Series*Drainage class:* Moderately well drained*Permeability:* Moderate*Landform:* Uplands*Parent material:* Deoxidized loess*Native vegetation:* Mixed prairie grasses and deciduous trees*Slope range:* 5 to 9 percent**Typical Pedon**

Hedrick silty clay loam, 5 to 9 percent slopes, moderately eroded, 600 feet west and 740 feet north of the center of sec. 23, T. 73 N., R. 9 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; about 20 percent streaks and pockets of brown (10YR 4/3) subsoil material; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

BE—7 to 13 inches; brown (10YR 4/3) silty clay loam; weak very fine and fine subangular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

Bt1—13 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; few fine roots; many distinct brown (10YR 4/3) clay films on faces of peds; few fine irregular soft masses of iron-manganese; slightly acid; clear smooth boundary.

Bt2—18 to 23 inches; mottled light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4) silty clay loam; common fine prominent yellowish brown (10YR 5/8) and common fine distinct grayish brown (10YR 5/2) mottles; moderate fine angular blocky structure; friable; few fine roots; many distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; clear smooth boundary.

Bt3—23 to 34 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate fine and medium angular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Bt4—34 to 42 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine prominent yellowish brown (10YR 5/4 and 5/8) and few fine prominent strong brown (7.5YR 5/6) mottles; weak fine and medium angular blocky structure; firm; few fine roots; common faint clay films on faces of peds;

few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

Bt5—42 to 56 inches; light brownish gray (2.5Y 6/2) silt loam; common fine prominent dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) mottles; weak fine and medium prismatic structure; firm; few fine roots; few faint clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

BC—56 to 60 inches; light brownish gray (2.5Y 6/2) silt loam; common fine prominent dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; friable; few fine roots; few fine irregular soft masses of iron-manganese; moderately acid.

Range in Characteristics

Thickness of the solum: 46 to 60 inches

Ap horizon:

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silt loam

BE horizon:

Hue—10YR

Value—4

Chroma—2 to 4

Texture—silt loam

Bt horizon (upper part):

Hue—7.5YR, 10YR, or 2.5Y

Value—4 to 6

Chroma—1 to 6

Texture—silty clay loam

Bt horizon (lower part):

Hue—2.5Y or 5Y

Value—5 or 6

Chroma—1 or 2

Texture—silty clay loam or silt loam

BC horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 or 6

Chroma—1 or 2

Texture—silty clay loam or silt loam

571C2—Hedrick silty clay loam, 5 to 9 percent slopes, moderately eroded**Composition**

Hedrick and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Shoulders and backslopes

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Deoxidized loess

Flooding: None

Depth to the water table: 4 to 6 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.6 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Rinda and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Inton Series

Drainage class: Moderately well drained

Permeability: Moderate

Landform: Uplands

Parent material: Deoxidized loess

Native vegetation: Forest

Slope range: 5 to 14 percent

Typical Pedon

Inton silty clay loam, 5 to 9 percent slopes, moderately eroded, 1,180 feet east and 1,160 feet

north of the southwest corner of sec. 10, T. 72 N., R. 11 W.

Ap—0 to 7 inches; brown (10YR 4/3) silty clay loam, light brownish gray (10YR 6/2) dry; about 20 percent streaks and pockets of dark yellowish brown (10YR 4/4) subsoil material; weak fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

Bt1—7 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine and medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; clear smooth boundary.

Bt2—15 to 39 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine and medium prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; few prominent very dark grayish brown (10YR 3/2) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; moderately acid; clear smooth boundary.

BC—39 to 48 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine and medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; weak coarse subangular blocky structure; friable; few fine roots; few prominent very dark grayish brown (10YR 3/2) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

C—48 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; many fine and medium prominent yellowish brown (10YR 5/6) and common fine prominent dark yellowish brown (10YR 4/6) mottles; massive; friable; few fine roots; few fine irregular soft masses of iron-manganese; slightly acid.

Range in Characteristics

Thickness of the solum: 30 to 50 inches

Ap horizon:

Hue—10YR

Value—4

Chroma—2 or 3

Texture—silty clay loam

Bt horizon (upper part):

Hue—10YR

Value—4 or 5

Chroma—3 or 4
Texture—silty clay loam

Bt horizon (lower part):

Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam

BC or C horizon:

Hue—2.5Y or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—silt loam or silty clay loam

572C2—Inton silty clay loam, 5 to 9 percent slopes, moderately eroded

Composition

Inton and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Shoulders and backslopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Deoxidized loess
Flooding: None
Depth to the water table: 4 to 6 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.5 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ashgrove and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

572D2—Inton silty clay loam, 9 to 14 percent slopes, moderately eroded

Composition

Inton and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Deoxidized loess
Flooding: None
Depth to the water table: 4 to 6 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.5 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ashgrove and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning

these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Kalona Series

Drainage class: Poorly drained

Permeability: Moderately slow

Landform: Upland flats

Parent material: Loess

Native vegetation: Prairie

Slope range: 0 to 1 percent

Typical Pedon

Kalona silty clay loam, 0 to 1 percent slopes, 1,092 feet north and 320 feet east of the southwest corner of sec. 12, T. 73 N., R. 11 W.

Ap—0 to 9 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; weak fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

A—9 to 15 inches; black (10YR 2/1) silty clay, dark gray (10YR 4/1) dry; moderate fine granular structure; friable; few fine roots; neutral; gradual smooth boundary.

AB—15 to 20 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; few fine prominent strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; few distinct black (10YR 2/1) organic coatings on faces of peds; few fine and medium irregular wormcasts; neutral; clear smooth boundary.

Bg1—20 to 25 inches; dark gray (5Y 4/1) silty clay; few fine prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; few distinct very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; gradual smooth boundary.

Bg2—25 to 35 inches; gray (5Y 5/1) silty clay loam; common medium prominent yellowish brown (10YR 5/6), few fine prominent strong brown (7.5YR 5/6), and few fine faint olive gray (5Y 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; very few distinct dark gray (5Y 4/1) organic coatings on faces of peds; slightly acid; gradual smooth boundary.

Bg3—35 to 41 inches; gray (5Y 5/1) silty clay loam; few fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting

to weak medium subangular blocky; firm; few fine roots; slightly acid; clear smooth boundary.

BCg—41 to 50 inches; olive gray (5Y 5/2) silty clay loam; many fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; friable; few fine roots; large very dark gray (10YR 3/1) channel fill or krotovina at a depth of 45 inches; few fine rounded calcium carbonate concretions; slightly alkaline; gradual smooth boundary.

Cg—50 to 60 inches; olive gray (5Y 5/2) silty clay loam; many coarse prominent strong brown (7.5YR 5/6) mottles; massive; friable; few fine roots; slightly alkaline.

Range in Characteristics

Thickness of the solum: 40 to 60 inches

Thickness of the mollic epipedon: 12 to 24 inches

Ap or A horizon:

Hue—10YR or neutral

Value—2

Chroma—0 or 1

Texture—silty clay loam or silty clay

AB horizon:

Hue—10YR

Value—2 or 3

Chroma—1

Texture—silty clay

Bg horizon:

Hue—10YR to 5Y

Value—4 or 5

Chroma—1 or 2

Texture—silty clay or silty clay loam

BCg or Cg horizon:

Hue—5Y

Value—4 or 5

Chroma—1 or 2

Texture—silt loam or silty clay loam

779—Kalona silty clay loam, 0 to 1 percent slopes

Composition

Kalona and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Upland flats

Geomorphic component: Divides

Hillslope position: Summits

Slope: 0 to 1 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Loess

Flooding: None

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 10.8 inches (high)

Content of organic matter in the surface layer: About 5.5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sperry and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Keomah Series

Drainage class: Somewhat poorly drained

Permeability: Slow

Landform: Upland flats

Parent material: Loess

Native vegetation: Forest

Slope range: 0 to 5 percent

Typical Pedon

Keomah silt loam, 0 to 2 percent slopes, 1,220 feet west and 120 feet south of the center of sec. 16, T. 73 N., R. 8 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silt loam, light gray (10YR 6/1) dry; weak very fine and fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

E—8 to 14 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; moderate medium platy structure parting to moderate very fine

subangular blocky; friable; few fine roots; few fine irregular soft masses of iron-manganese; strongly acid; clear smooth boundary.

BE—14 to 18 inches; grayish brown (10YR 5/2) and brown (10YR 5/3) silty clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure parting to moderate very fine subangular blocky; friable; few fine roots; few fine irregular soft masses of iron-manganese; very strongly acid; clear smooth boundary.

Bt1—18 to 28 inches; brown (10YR 5/3) silty clay; common fine distinct yellowish brown (10YR 5/6) and few fine faint dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds; few fine irregular soft masses of iron-manganese; very strongly acid; gradual smooth boundary.

Bt2—28 to 47 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium and coarse subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds; very few very dark grayish brown (10YR 3/2) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

C—47 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine and medium prominent strong brown (7.5YR 5/8) and many fine prominent yellowish brown (10YR 5/6) mottles; massive; friable; few fine roots; few very dark grayish brown (10YR 3/2) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; moderately acid.

Range in Characteristics

Thickness of the solum: 40 to 60 inches

Ap horizon:

Hue—10YR

Value—4

Chroma—1 or 2

Texture—silt loam

E horizon:

Hue—10YR

Value—4 or 5

Chroma—1 to 3

Texture—silt loam

BE horizon:

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—silty clay loam

2Bt horizon (upper part):

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—silty clay

2Bt horizon (lower part):

Hue—10YR to 5Y

Value—4 or 5

Chroma—2 or 3

Texture—silty clay loam

2C horizon:

Hue—10YR to 5Y

Value—4 or 5

Chroma—2 to 4

Texture—silty clay loam or silt loam

180—Keomah silt loam, 0 to 2 percent slopes

Composition

Keomah and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Uplands

Geomorphic component: Divides

Hillslope position: Summits

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 12.0 inches (high)

Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Rubio and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

180B—Keomah silt loam, 2 to 5 percent slopes

Composition

Keomah and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Uplands

Geomorphic component: Interfluves

Hillslope position: Shoulders and summits

Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.9 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Rubio and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Keswick Series

Drainage class: Moderately well drained

Permeability: Slow

Landform: Uplands

Parent material: Pedisements over reddish paleosol weathered from glacial till

Native vegetation: Forest

Slope range: 9 to 18 percent

Typical Pedon

Keswick loam, 9 to 14 percent slopes, 1,760 feet north and 140 feet west of the center of sec. 19, T. 71 N., R. 11 W.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; many fine and medium roots; moderately acid; clear wavy boundary.

E—4 to 8 inches; brown (10YR 5/3) loam, pale brown (10YR 6/3) dry; few fine faint yellowish brown (10YR 5/4) mottles; weak thin and medium platy structure; friable; few fine and medium roots; very few distinct white (10YR 8/1) silt coatings on faces of peds; strongly acid; gradual wavy boundary.

BE—8 to 12 inches; yellowish brown (10YR 5/4) loam; weak fine subangular blocky structure; friable; few fine and medium roots; very few distinct white (10YR 8/1) silt coatings on faces of peds; very strongly acid; gradual smooth boundary.

2Bt1—12 to 17 inches; strong brown (7.5YR 5/6) clay loam; few fine distinct yellowish red (5YR 4/6) and prominent grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine and medium roots; common distinct clay films on faces of peds; very strongly acid; gradual smooth boundary.

2Bt2—17 to 24 inches; strong brown (7.5YR 4/6) clay; many medium distinct yellowish red (5YR 5/6), common fine prominent grayish brown (10YR 5/2), and few prominent dark red (2.5YR 3/6) mottles; strong medium subangular blocky structure; very firm; few fine and medium roots; many distinct clay films on faces of peds; very strongly acid; gradual smooth boundary.

2Bt3—24 to 31 inches; yellowish red (5YR 4/6) clay; many medium distinct strong brown (7.5YR 4/6),

common fine prominent grayish brown (10YR 5/2), and few dark red (2.5YR 3/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; few fine and medium roots; many distinct clay films on faces of peds; very strongly acid; gradual wavy boundary.

2Bt4—31 to 39 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; few fine and medium roots; common distinct clay films on faces of peds; very strongly acid; gradual smooth boundary.

2Bt5—39 to 52 inches; yellowish brown (10YR 5/6) clay loam; common fine prominent grayish brown (10YR 5/2) mottles; moderate medium prismatic structure; firm; few fine and medium roots; few distinct clay films on faces of peds; very strongly acid; gradual smooth boundary.

2BC—52 to 60 inches; mottled yellowish brown (10YR 5/4), brown (7.5YR 5/2), and strong brown (7.5YR 5/6) clay loam; weak medium prismatic structure; firm; few distinct clay films on faces of peds; very strongly acid.

Range in Characteristics

Thickness of the solum: 42 to more than 60 inches

Depth to carbonates: 42 to more than 60 inches

A horizon:

Hue—10YR

Value—2 to 4

Chroma—1 or 2

Texture—loam or clay loam

E horizon:

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—loam or clay loam

BE horizon:

Hue—10YR

Value—4 or 5

Chroma—3 or 4

Texture—loam or clay loam

2Bt horizon (upper part):

Hue—5YR or 7.5YR

Value—4 or 5

Chroma—3 to 6

Texture—clay loam or clay

2Bt horizon (lower part):

Hue—7.5YR to 5Y

Value—4 or 5
 Chroma—1 to 6
 Texture—clay loam or clay

2BC horizon:

Hue—7.5YR to 5Y
 Value—4 or 5
 Chroma—1 to 6
 Texture—clay loam

425D—Keswick loam, 9 to 14 percent slopes

Composition

Keswick and similar soils: About 90 percent
 Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Pedisements over reddish paleosol weathered from glacial till
Flooding: None
Depth to the water table: 1 to 3 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 8.9 inches (moderate)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lindley and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

425D2—Keswick clay loam, 9 to 14 percent slopes, moderately eroded

Composition

Keswick and similar soils: About 90 percent
 Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Pedisements over reddish paleosol weathered from glacial till
Flooding: None
Depth to the water table: 1 to 3 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 8.8 inches (moderate)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Lindley and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

- Forest Land section

Klum Series

Drainage class: Moderately well drained

Permeability: Moderately rapid

Landform: Flood plains

Parent material: Alluvium

Native vegetation: Mixed prairie grasses and deciduous trees

Slope range: 0 to 2 percent

Typical Pedon

Klum fine sandy loam, 0 to 2 percent slopes, 1,300 feet south and 1,140 feet west of the northeast corner of sec. 5, T. 72 N., R. 8 W.

- Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) fine sandy loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; friable; common very fine and fine roots; moderately acid; abrupt smooth boundary.
- C1—9 to 20 inches; stratified dark brown (10YR 3/3) and grayish brown (10YR 5/2) sandy loam; massive with horizontal cleavage planes; friable; common very fine and fine roots; moderately acid; gradual smooth boundary.
- C2—20 to 30 inches; stratified brown (10YR 4/3) and grayish brown (10YR 5/2) loamy fine sand and silt loam; massive with horizontal cleavage planes; friable; common very fine and fine roots; moderately acid; gradual smooth boundary.
- C3—30 to 43 inches; stratified very dark grayish brown (10YR 3/2), dark brown (10YR 3/3), brown (10YR 4/3), and grayish brown (10YR 5/2) loamy fine sand and silt loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; massive with horizontal cleavage planes; friable; moderately acid; gradual smooth boundary.
- C4—43 to 60 inches; stratified brown (10YR 4/3), olive gray (5Y 4/2), and dark brown (10YR 3/3) loamy fine sand and silt loam; common fine prominent reddish brown (5YR 4/4) and common fine distinct olive gray (5Y 5/2) mottles; massive; friable; slightly acid.

Range in Characteristics

Thickness of the solum: 6 to 10 inches

Ap horizon:

Hue—10YR

Value—2 or 3

Chroma—2 or 3

Texture—fine sandy loam

C horizon:

Hue—7.5YR to 2.5Y

Value—3 to 5

Chroma—2 to 8

Texture—loamy sand, fine sandy loam, sandy loam, silt loam, loam, or loamy fine sand

208—Klum fine sandy loam, 0 to 2 percent slopes

Composition

Klum and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Component Description

Surface layer texture: Fine sandy loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Alluvium

Frequency of flooding: Occasional

Depth to the water table: 3 to 6 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 9.5 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a substratum of silty clay

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Ladoga Series

Drainage class: Moderately well drained

Permeability: Moderately slow

Landform: Uplands and stream terraces

Parent material: Loess

Native vegetation: Mixed prairie grasses and deciduous trees

Slope range: 2 to 14 percent

Typical Pedon

Ladoga silt loam, 2 to 5 percent slopes, 125 feet south and 70 feet west of the northeast corner of sec. 6, T. 72 N., R. 11 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

E—8 to 13 inches; brown (10YR 4/3) and dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate very fine and fine subangular blocky structure parting to weak very thin platy; friable; few fine roots; very few distinct light gray (10YR 7/2) silt coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—13 to 20 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt2—20 to 25 inches; dark yellowish brown (10YR 4/4) silty clay; moderate fine subangular blocky structure; very firm; few fine roots; many distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

Bt3—25 to 32 inches; brown (10YR 5/3) silty clay loam; common fine distinct strong brown (7.5YR 5/6) and brown (7.5YR 4/4) mottles; moderate fine and medium prismatic structure parting to moderate fine and medium subangular blocky; very firm; few fine roots; common distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

Bt4—32 to 45 inches; brown (10YR 5/3) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6) and common fine prominent strong brown (7.5YR 5/6) mottles; moderate fine and medium prismatic structure parting to

moderate fine and medium subangular blocky; very firm; few fine roots; common distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

Bt5—45 to 54 inches; grayish brown (10YR 5/2) silty clay loam; common fine and medium prominent strong brown (7.5YR 5/6) and yellowish red (5YR 5/8) mottles; weak fine and medium prismatic structure parting to weak fine and medium subangular blocky; firm; few fine roots; few distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

C—54 to 60 inches; grayish brown (10YR 5/2) silt loam; common fine and medium prominent strong brown (7.5YR 5/6) and few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; few fine roots; few fine irregular soft masses of iron-manganese; moderately acid.

Range in Characteristics

Thickness of the solum: 36 to 60 inches

Ap horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silt loam or silty clay loam

E horizon (if it occurs):

Hue—10YR

Value—4 or 5

Chroma—2

Texture—silt loam

Bt horizon:

Hue—10YR to 5Y

Value—4 to 6

Chroma—2 to 4

Texture—silty clay loam or silty clay

BC horizon:

Hue—10YR

Value—5

Chroma—2 to 4

Texture—silty clay loam

C horizon:

Hue—10YR

Value—5

Chroma—2 to 4

Texture—silt loam

76B—Ladoga silt loam, 2 to 5 percent slopes**Composition**

Ladoga and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes

Hillslope position: Shoulders and summits

Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 4 to 6 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.9 inches (high)

Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils
- Somewhat poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

76C2—Ladoga silty clay loam, 5 to 9 percent slopes, moderately eroded**Composition**

Ladoga and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes and shoulders

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 4 to 6 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.8 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bucknell and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

76D2—Ladoga silty clay loam, 9 to 14 percent slopes, moderately eroded**Composition**

Ladoga and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Side slopes, nose slopes, and head slopes
Hillslope position: Backslopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: 4 to 6 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.8 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Bucknell and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

876B—Ladoga silt loam, bench, 2 to 5 percent slopes

Composition

Ladoga and similar soils: About 90 percent
 Inclusions: About 10 percent

Setting

Landform: Stream terraces
Geomorphic component: Side slopes
Hillslope position: Summits, shoulders, and backslopes
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: 4 to 6 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.9 inches (high)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

876C2—Ladoga silty clay loam, bench, 5 to 9 percent slopes, moderately eroded

Composition

Ladoga and similar soils: About 85 percent
 Inclusions: About 15 percent

Setting

Landform: Stream terraces
Geomorphic component: Side slopes
Hillslope position: Backslopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Loess

Flooding: None

Depth to the water table: 4 to 6 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.8 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a sandy and gravelly subsoil
- Galland and similar soils
- Areas of severely eroded soils
- Givin and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Lamoni Series

Drainage class: Somewhat poorly drained

Permeability: Slow

Landform: Uplands

Parent material: Pedisediments over gray paleosol weathered from glacial till

Native vegetation: Prairie

Slope range: 9 to 14 percent

Taxadjunct features: The Lamoni soils in this county do not have a mollic epipedon.

Typical Pedon

Lamoni silty clay loam, 9 to 14 percent slopes, moderately eroded, 1,490 feet east and 600 feet north of the center of sec. 12, T. 72 N., R. 10 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; common streaks and pockets of brown (10YR 4/3) subsoil material; moderate medium granular structure;

friable; few fine roots; moderately acid; abrupt smooth boundary.

BA—7 to 12 inches; brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; firm; few fine roots; many distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; moderately acid; clear smooth boundary.

2Btg1—12 to 17 inches; dark grayish brown (10YR 4/2) clay; many fine distinct gray (10YR 5/1), few fine prominent yellowish brown (10YR 5/8), and few fine prominent red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; very firm; few fine roots; very few faint clay films on faces of peds; few fine irregular soft masses of iron-manganese; few fine pebbles; moderately acid; gradual smooth boundary.

2Btg2—17 to 24 inches; gray (10YR 5/1) clay; many fine distinct yellowish brown (10YR 5/4) and few fine prominent yellowish brown (10YR 5/8) and red (2.5YR 4/8) mottles; moderate medium subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds; few fine irregular soft masses of iron-manganese; few fine pebbles; moderately acid; gradual smooth boundary.

2Btg3—24 to 31 inches; gray (10YR 5/1) clay; common fine and medium distinct yellowish brown (10YR 5/4) and few fine prominent red (2.5YR 4/8) mottles; weak medium and coarse subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds; few fine irregular soft masses of iron-manganese; few fine pebbles; moderately acid; gradual smooth boundary.

2Btg4—31 to 42 inches; light gray (10YR 6/1) clay loam; many medium distinct yellowish brown (10YR 5/4) and common medium and coarse prominent yellowish brown (10YR 5/8) mottles; weak medium and coarse subangular blocky structure; firm; many distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; few fine pebbles; neutral; gradual smooth boundary.

2Btg5—42 to 52 inches; light gray (10YR 6/1) clay loam; common medium and coarse distinct yellowish brown (10YR 5/4) and common fine prominent yellowish brown (10YR 5/8) mottles; weak medium and coarse subangular blocky structure; firm; many distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; few fine pebbles; neutral; gradual smooth boundary.

2C—52 to 60 inches; yellowish brown (10YR 5/6) clay loam; many medium and coarse prominent

light gray (10YR 6/1) mottles; massive; firm; few fine irregular soft masses of iron-manganese; neutral.

Range in Characteristics

Thickness of the solum: 48 to 60 inches

Ap horizon:

Hue—10YR
Value—2 or 3
Chroma—1 or 2
Texture—silty clay loam

BA horizon:

Hue—10YR
Value—4
Chroma—3
Texture—silty clay loam

2Btg horizon:

Hue—10YR to 5Y
Value—4 to 6
Chroma—1 to 6
Texture—clay or clay loam

2C horizon:

Hue—10YR to 5Y
Value—4 to 6
Chroma—1 to 6
Texture—clay loam

822D2—Lamoni silty clay loam, 9 to 14 percent slopes, moderately eroded

Composition

Lamoni and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Pedis sediment over gray paleosol weathered from glacial till
Flooding: None
Depth to the water table: 1 to 3 feet
Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 9.6 inches (high)
Content of organic matter in the surface layer: About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas that are not eroded

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Lindley Series

Drainage class: Well drained
Permeability: Moderately slow
Landform: Uplands
Parent material: Glacial till
Native vegetation: Forest
Slope range: 9 to 40 percent

Typical Pedon

Lindley loam, 25 to 40 percent slopes, 1,835 feet north and 140 feet east of the center of sec. 19, T. 71 N., R. 11 W.

- A—0 to 5 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (2.5Y 5/2) dry; weak fine granular structure; friable; many fine and medium roots; slightly acid; clear smooth boundary.
- E—5 to 10 inches; brown (10YR 5/3) loam, very pale brown (10YR 7/3) dry; weak medium platy structure parting to weak medium subangular blocky; friable; many fine and medium roots; very few faint light brownish gray (10YR 6/2) silt coatings on faces of peds; strongly acid; clear wavy boundary.
- Bt1—10 to 16 inches; yellowish brown (10YR 5/6) loam; weak fine and medium subangular blocky structure; friable; few fine roots; very few faint yellowish brown (10YR 5/4) clay films on faces of peds and in pores; few fine pebbles; very strongly acid; gradual smooth boundary.

Bt2—16 to 26 inches; yellowish brown (10YR 5/6) clay loam; few fine distinct strong brown (7.5YR 4/6) mottles; moderate fine and medium subangular blocky structure; friable; few fine roots; many distinct clay films on faces of peds; few fine pebbles; very strongly acid; gradual smooth boundary.

Bt3—26 to 31 inches; yellowish brown (10YR 5/6) clay loam; few fine distinct strong brown (7.5YR 4/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; few fine pebbles; very strongly acid; gradual smooth boundary.

Bt4—31 to 41 inches; yellowish brown (10YR 5/6) clay loam; few fine distinct strong brown (7.5YR 4/6) and brown (10YR 5/3) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; many distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; few fine pebbles; very strongly acid; gradual smooth boundary.

Bt5—41 to 48 inches; yellowish brown (10YR 5/6) clay loam; few fine distinct strong brown (7.5YR 4/6) and grayish brown (10YR 5/2) mottles; weak medium prismatic structure; firm; few fine roots; very few faint clay films on faces of peds and in pores; few fine irregular soft masses of iron-manganese; few fine pebbles; very strongly acid; gradual smooth boundary.

C—48 to 60 inches; mottled yellowish brown (10YR 5/6), grayish brown (10YR 5/2), and strong brown (7.5YR 5/6) clay loam; massive; firm; few fine pebbles; slightly acid.

Range in Characteristics

Thickness of the solum: 30 to 50 inches

A or Ap horizon:

Hue—10YR
Value—3 to 5
Chroma—1 to 5
Texture—loam

E horizon (if it occurs):

Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—loam

Bt horizon:

Hue—10YR or 7.5YR
Value—4 or 5
Chroma—4 to 8
Texture—loam or clay loam

C horizon:

Hue—10YR or 7.5YR
Value—4 or 5
Chroma—4 to 6
Texture—loam or clay loam

65D2—Lindley loam, 9 to 14 percent slopes, moderately eroded

Composition

Lindley and similar soils: About 85 percent

Inclusions: About 15 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 9 to 14 percent

Component Description

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Well drained

Dominant parent material: Glacial till

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 9.4 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Keswick and similar soils
- Ashgrove and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

65E—Lindley loam, 14 to 18 percent slopes

Composition

Lindley and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Glacial till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.5 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Keswick and similar soils
- Soils that have a surface layer of silt loam

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

65E2—Lindley loam, 14 to 18 percent slopes, moderately eroded

Composition

Lindley and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope: 14 to 18 percent

Component Description

Surface layer texture: Loam
Depth to bedrock: Greater than 60 inches
Drainage class: Well drained
Dominant parent material: Glacial till
Flooding: None
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 9.3 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Keswick and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

65F2—Lindley loam, 18 to 25 percent slopes, moderately eroded

Composition

Lindley and similar soils: About 85 percent
Inclusions: About 15 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope: 18 to 25 percent

Component Description

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Well drained

Dominant parent material: Glacial till

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 9.3 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas that have limestone bedrock at the surface
- Soils that have a subsoil of sandy loam
- Areas of severely eroded soils

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

65G—Lindley loam, 25 to 40 percent slopes**Composition**

Lindley and similar soils: About 85 percent

Inclusions: About 15 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 25 to 40 percent

Component Description

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Well drained

Dominant parent material: Glacial till

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 9.5 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas that have limestone bedrock at the surface
- Soils that have a surface layer of silt loam
- Areas of eroded soils

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

424D2—Lindley-Keswick complex, 9 to 14 percent slopes, moderately eroded**Composition**

Lindley and similar soils: About 45 percent

Keswick and similar soils: About 45 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 9 to 14 percent

Component Description**Lindley**

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Well drained

Dominant parent material: Glacial till

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 9.4 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

Keswick

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Pedisements over reddish paleosol weathered from glacial till

Flooding: None

Depth to the water table: 1 to 3 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 8.8 inches (moderate)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ashgrove and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

424E2—Lindley-Keswick complex, 14 to 18 percent slopes, moderately eroded

Composition

Lindley and similar soils: About 45 percent

Keswick and similar soils: About 45 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 14 to 18 percent

Component Description

Lindley

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Well drained

Dominant parent material: Glacial till

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 9.3 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

Keswick

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Pedisements over reddish paleosol weathered from glacial till

Flooding: None

Depth to the water table: 1 to 3 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 8.7 inches (moderate)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ashgrove and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Mahaska Series

Drainage class: Somewhat poorly drained

Permeability: Moderate

Landform: Uplands

Parent material: Loess

Native vegetation: Prairie

Slope range: 0 to 5 percent

Typical Pedon

Mahaska silty clay loam, 2 to 5 percent slopes, 750 feet east and 530 feet north of the southwest corner of sec. 24, T. 73 N., R. 11 W.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine granular structure; friable; few fine roots; very few prominent white (10YR 8/1) silt coatings on faces of peds; neutral; abrupt smooth boundary.

A1—8 to 16 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak medium granular structure; friable; few fine roots; very few prominent white (10YR 8/1) silt coatings on faces of peds; neutral; clear smooth boundary.

A2—16 to 20 inches; very dark grayish brown (10YR 3/2) silty clay loam, gray (10YR 5/1) dry; weak fine subangular blocky structure; friable; few fine roots; very few prominent white (10YR 8/1) silt coatings on faces of peds; moderately acid; clear smooth boundary.

BA—20 to 24 inches; dark grayish brown (2.5Y 4/2) silty clay loam; few fine distinct brown (10YR 5/3) mottles; moderate fine and medium subangular blocky structure; friable; few fine roots; few prominent white (10YR 8/1) silt coatings on faces of peds; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds and in pores; strongly acid; clear smooth boundary.

Bt1—24 to 31 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Bt2—31 to 37 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6 and 5/8) mottles; strong medium subangular blocky structure; firm; few fine roots; many distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Bt3—37 to 49 inches; mottled light brownish gray (2.5Y 6/2) and yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; common distinct clay films on faces of peds; few fine irregular soft

masses of iron-manganese; strongly acid; gradual smooth boundary.

Bt4—49 to 55 inches; mottled light brownish gray (2.5Y 6/2), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/8) silty clay loam; moderate medium subangular blocky structure; friable; few distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

BC—55 to 60 inches; mottled light brownish gray (2.5Y 6/2), yellowish brown (10YR 5/6), and strong brown (7.5YR 5/8) silty clay loam; weak medium subangular blocky structure; friable; few fine irregular soft masses of iron-manganese; moderately acid.

Range in Characteristics

Thickness of the solum: 48 to more than 60 inches

Thickness of the mollic epipedon: 14 to 24 inches

Ap or A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silty clay loam

BA horizon:

Hue—2.5Y or 10YR

Value—3 or 4

Chroma—2 to 4

Texture—silty clay loam

Bt horizon (upper part):

Hue—2.5Y or 10YR

Value—4 or 5

Chroma—2 or 3

Texture—silty clay loam or silty clay

Bt horizon (lower part):

Hue—2.5Y or 5Y

Value—4 to 6

Chroma—2 or 3

Texture—silty clay loam or silty clay

BC horizon:

Hue—2.5Y or 5Y

Value—4 to 6

Chroma—2 or 3

Texture—silty clay loam or silty clay

280—Mahaska silty clay loam, 0 to 2 percent slopes

Composition

Mahaska and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Divides
Hillslope position: Summits
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.0 inches (high)
Content of organic matter in the surface layer: About 5.5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Taintor and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

280B—Mahaska silty clay loam, 2 to 5 percent slopes

Composition

Mahaska and similar soils: About 95 percent
 Inclusions: About 5 percent

Setting

Landform: Uplands
Geomorphic component: Interfluves, head slopes, nose slopes, and side slopes
Hillslope position: Shoulders and summits
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.1 inches (high)
Content of organic matter in the surface layer: About 5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Nira Series

Drainage class: Moderately well drained
Permeability: Moderate
Landform: Uplands
Parent material: Deoxidized loess
Native vegetation: Prairie
Slope range: 5 to 9 percent
Taxadjunct features: The Nira soils in this county do not have a mollic epipedon.

Typical Pedon

Nira silty clay loam, 5 to 9 percent slopes, moderately eroded, 695 feet east and 175 feet south of the center of sec. 15, T. 73 N., R. 11 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, grayish brown (2.5Y 5/2) dry; about 30 percent streaks and pockets of brown (10YR 4/3) subsoil material; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

BA—7 to 11 inches; brown (10YR 4/3) silty clay loam; about 20 percent mixings of very dark gray (10YR 3/1) material from the surface layer; weak very fine and fine subangular blocky structure; friable; few fine roots; neutral; abrupt smooth boundary.

Bw1—11 to 16 inches; brown (10YR 4/3) silty clay loam; weak fine subangular blocky structure; friable; few fine roots; few distinct organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bw2—16 to 21 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; few fine roots; few distinct organic coatings on faces of peds; strongly acid; clear smooth boundary.

Bw3—21 to 31 inches; gray (5Y 5/1) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to weak fine and medium subangular blocky; friable; few fine roots; few distinct organic coatings on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

BC—31 to 39 inches; gray (5Y 5/1) silty clay loam; few fine prominent yellowish brown (10YR 5/8) mottles; weak medium prismatic structure; friable; few fine roots; few distinct organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

C1—39 to 46 inches; gray (5Y 5/1) silty clay loam; few medium prominent yellowish brown (10YR 5/8) mottles; massive; friable; few fine roots; few distinct organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

C2—46 to 60 inches; gray (5Y 5/1) silty clay loam; common fine faint olive gray (5Y 5/2) and many medium and coarse prominent yellowish brown (10YR 5/8) mottles; massive; friable; few distinct organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; moderately acid.

Range in Characteristics

Thickness of the solum: 30 to 50 inches

Ap horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—silty clay loam

Bw horizon (upper part):

Hue—10YR

Value—4 or 5

Chroma—1 to 4

Texture—silty clay loam

Bw horizon (lower part, within a depth of 30 inches):

Hue—2.5Y or 5Y

Value—5 or 6

Chroma—1 or 2

Texture—silty clay loam

BC or C horizon:

Hue—2.5Y or 5Y

Value—5 or 6

Chroma—1 or 2

Texture—silty clay loam

570C2—Nira silty clay loam, 5 to 9 percent slopes, moderately eroded

Composition

Nira and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Shoulders and backslopes

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Deoxidized loess

Flooding: None

Depth to the water table: 4 to 6 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)

Content of organic matter in the surface layer: About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Clarinda and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Nodaway Series

Drainage class: Moderately well drained

Permeability: Moderate

Landform: Flood plains and upland drainageways

Parent material: Silty alluvium or local alluvium

Native vegetation: Mixed prairie grasses and deciduous trees

Slope range: 0 to 5 percent

Typical Pedon

Nodaway silt loam, 0 to 2 percent slopes, 1,820 feet west and 142 feet south of the northeast corner of sec. 2, T. 72 N., R. 8 W.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine subangular blocky structure parting to weak very fine and fine granular; friable; few fine roots; neutral; abrupt smooth boundary.

C—7 to 60 inches; stratified dark grayish brown (10YR 4/2), very dark grayish brown (10YR 3/2), grayish brown (10YR 5/2), and brown (10YR 5/3) silt loam; massive but appears platy because of stratification; friable; few fine roots; neutral.

Range in Characteristics

Thickness of the solum: 6 to 10 inches

Ap horizon:

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silt loam

C horizon:

Hue—10YR

Value—3 to 5

Chroma—1 to 4

Texture—silt loam

220—Nodaway silt loam, 0 to 2 percent slopes

Composition

Nodaway and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Silty alluvium

Frequency of flooding: Occasional

Depth to the water table: 3 to 5 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a substratum of sandy loam
- Soils that have a substratum of silty clay

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

315—Nodaway-Klum-Perks complex, 0 to 3 percent slopes

Composition

Nodaway and similar soils: About 50 percent

Klum and similar soils: About 30 percent

Perks and similar soils: About 20 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Component Description

Nodaway

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Local alluvium

Frequency of flooding: Occasional

Depth to the water table: 3 to 5 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

Klum

Surface layer texture: Fine sandy loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Local alluvium

Frequency of flooding: Occasional

Depth to the water table: 3 to 6 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 9.5 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

Perks

Surface layer texture: Sand

Depth to bedrock: Greater than 60 inches

Drainage class: Excessively drained

Dominant parent material: Local alluvium

Frequency of flooding: Occasional

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 2.3 inches (very low)

Content of organic matter in the surface layer: About 1.25 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

729—Nodaway-Coppock complex, 0 to 2 percent slopes

Composition

Nodaway and similar soils: About 55 percent

Coppock and similar soils: About 40 percent

Inclusions: About 5 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Component Description

Nodaway

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Silty alluvium

Frequency of flooding: Occasional

Depth to the water table: 3 to 5 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

Coppock

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Silty alluvium

Frequency of flooding: Occasional

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)

Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of stratified sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

730B—Nodaway-Coppock-Cantril complex, 2 to 5 percent slopes

Composition

Nodaway and similar soils: About 40 percent

Coppock and similar soils: About 40 percent

Cantril and similar soils: About 20 percent

Setting

Landform: Upland drainageways

Geomorphic component: Base slopes

Hillslope position: Footslopes and toeslopes

Slope: 2 to 5 percent

Component Description

Nodaway

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Silty alluvium

Frequency of flooding: Occasional

Depth to the water table: 3 to 5 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

Coppock

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Silty alluvium

Flooding: None

Depth to the water table: 1 to 3 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

Cantril

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Local alluvium or colluvium

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 9.4 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

1715—Nodaway-Vesser-Ackmore complex, 0 to 2 percent slopes

Composition

Nodaway and similar soils: About 40 percent

Vesser and similar soils: About 35 percent

Ackmore and similar soils: About 20 percent

Inclusions: About 5 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Component Description

Nodaway

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Silty alluvium

Frequency of flooding: Occasional

Depth to the water table: 3 to 5 feet

Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.9 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

Vesser

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Occasional
Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.9 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

Ackmore

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Occasional
Depth to the water table: 1 to 3 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.2 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a substratum of sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Nordness Series

Drainage class: Well drained
Permeability: Moderate
Landform: Uplands
Parent material: Loess over limestone
Native vegetation: Forest
Slope range: 25 to 40 percent

Typical Pedon

Nordness silt loam, 25 to 40 percent slopes, 2,340 feet east and 1,020 feet north of the southwest corner of sec. 1, T. 73 N., R. 8 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, very pale brown (10YR 7/3) dry; weak fine granular structure; friable; few fine roots; neutral; clear smooth boundary.

E—4 to 8 inches; grayish brown (10YR 5/2) silt loam; weak thin platy structure; friable; few fine roots; moderately acid; clear smooth boundary.

BE—8 to 11 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine subangular blocky structure; friable; few fine roots; moderately acid; clear smooth boundary.

2Bt—11 to 17 inches; strong brown (7.5YR 5/6) clay loam; weak fine subangular blocky structure; firm; few fine roots; few faint clay films on faces of peds; about 5 percent fine limestone fragments and glacial pebbles; strongly acid; abrupt wavy boundary.

2R—17 inches; fractured limestone bedrock.

Range in Characteristics

Thickness of the solum: 8 to 20 inches

A horizon:

Hue—10YR
 Value—3 or 4
 Chroma—1 to 3
 Texture—silt loam

E horizon (if it occurs):

Hue—10YR
 Value—4 or 5
 Chroma—2 or 3
 Texture—silt loam or loam

BE horizon:

Hue—10YR
 Value—4
 Chroma—3 or 4
 Texture—silt loam, silty clay loam, loam, or clay loam

2Bt horizon:

Hue—7.5YR or 5YR

Value—3 to 5

Chroma—2 to 6

Texture—silt loam, silty clay loam, loam, or clay loam

Content of coarse fragments—5 to 10 percent

499G—Nordness silt loam, 25 to 40 percent slopes***Composition***

Nordness and similar soils: About 90 percent

Inclusions: About 10 percent

Setting*Landform:* Uplands*Geomorphic component:* Head slopes, nose slopes, and side slopes*Hillslope position:* Backslopes*Slope:* 25 to 40 percent***Component Description****Surface layer texture:* Silt loam*Depth to bedrock:* 8 to 20 inches*Drainage class:* Well drained*Dominant parent material:* Loess over limestone*Flooding:* None*Depth to the water table:* Greater than 6.0 feet*Available water capacity to 60 inches or root-limiting layer:* About 3.1 inches (low)*Content of organic matter in the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas that have limestone bedrock at the surface
- Soils that are deeper over bedrock

Major Uses of the Unit

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Okaw Series*Drainage class:* Poorly drained*Permeability:* Very slow*Landform:* Stream terraces*Parent material:* Local alluvium*Native vegetation:* Forest*Slope range:* 0 to 2 percent***Typical Pedon***

Okaw silt loam, 0 to 2 percent slopes, 530 feet east and 1,800 feet north of the southwest corner of sec. 13, T. 73 N., R. 8 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak very fine and fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

E—8 to 17 inches; light brownish gray (10YR 6/2) silt loam, white (10YR 8/2) dry; few fine prominent strong brown (7.5YR 5/6) mottles; moderate thin platy structure; friable; few fine roots; strongly acid; gradual smooth boundary.

2Btg1—17 to 24 inches; grayish brown (10YR 5/2) silty clay; common fine prominent strong brown (7.5YR 5/6) mottles; strong fine and medium angular blocky structure; very firm; few fine roots; many prominent dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; few distinct white (10YR 8/1) silt coatings on faces of peds; very strongly acid; clear smooth boundary.

2Btg2—24 to 40 inches; grayish brown (10YR 5/2) silty clay; common medium faint brown (10YR 4/3 and 5/3) and common medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate coarse subangular blocky; very firm; few fine roots; many distinct clay films on faces of peds and in pores; very strongly acid; gradual smooth boundary.

2Btg3—40 to 48 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent strong brown (7.5YR 4/6 and 5/6) mottles; weak medium prismatic structure parting to moderate coarse subangular blocky; very firm; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds and common faint clay films on faces of peds and in pores; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

2BCg—48 to 55 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium prominent strong brown (7.5YR 4/6 and 5/6) mottles; weak medium prismatic structure; very firm; common distinct

very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

2Cg—55 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common coarse faint dark gray (10YR 4/1) and many medium prominent strong brown (7.5YR 4/6 and 5/6) mottles; massive; firm; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid.

Range in Characteristics

Thickness of the solum: 40 to 60 inches

Ap horizon:

Hue—10YR
Value—4 or 5
Chroma—1 or 2
Texture—silt loam

E horizon:

Hue—10YR
Value—4 to 7
Chroma—1 or 2
Texture—silt loam

2Btg horizon (upper part):

Hue—10YR, 2.5Y, or neutral
Value—3 to 6
Chroma—0 to 2
Texture—silty clay or clay

2Btg horizon (lower part):

Hue—10YR, 2.5Y, or neutral
Value—3 to 6
Chroma—0 to 2
Texture—silty clay, clay, or silty clay loam

2BCg or 2Cg horizon:

Hue—10YR to 5Y
Value—4 or 5
Chroma—2 or 3
Texture—silty clay, clay, or silty clay loam

263—Okaw silt loam, 0 to 2 percent slopes

Composition

Okaw and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Stream terraces
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Local alluvium
Frequency of flooding: Rare
Seasonal high water table: 0.5 foot above to 1.0 foot below the surface
Kind of water table: Apparent
Ponding duration: Brief
Available water capacity to 60 inches or root-limiting layer: About 9.7 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Somewhat poorly drained soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Olmitz Series

Drainage class: Moderately well drained
Permeability: Moderate
Landform: Upland drainageways and alluvial fans
Parent material: Loamy alluvium or local alluvium
Native vegetation: Prairie
Slope range: 2 to 5 percent

Typical Pedon

Olmitz loam, in an area of Olmitz-Vesser-Zook complex, 0 to 5 percent slopes, 1,280 feet east and 680 feet south of the northwest corner of sec. 7, T. 72 N., R. 10 W.

Ap—0 to 8 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak very fine and fine granular

structure; friable; few fine roots; moderately acid; abrupt smooth boundary.

A1—8 to 19 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; weak very fine and fine subangular blocky structure; friable; few fine roots; moderately acid; gradual smooth boundary.

A2—19 to 25 inches; very dark brown (10YR 2/2) loam, dark grayish brown (10YR 4/2) dry; weak fine and medium subangular blocky structure; friable; few fine roots; moderately acid; gradual smooth boundary.

Bw1—25 to 33 inches; brown (10YR 4/3) loam; moderate medium subangular blocky structure; friable; few fine roots; common distinct very dark grayish brown (10YR 3/2) and many faint dark brown (10YR 3/3) organic coatings on faces of peds; moderately acid; gradual smooth boundary.

Bw2—33 to 43 inches; dark yellowish brown (10YR 4/4) clay loam; few fine faint yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; few fine roots; few distinct brown (10YR 4/3) coatings on faces of peds; moderately acid; gradual smooth boundary.

2BC—43 to 60 inches; yellowish brown (10YR 5/4) clay loam; common fine faint yellowish brown (10YR 5/6) and few fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to weak medium and coarse subangular blocky; firm; few fine roots; few distinct light gray (10YR 7/2) silt coatings on faces of peds in the upper part; few fine irregular soft masses of iron-manganese; few fine pebbles; strongly acid.

Range in Characteristics

Thickness of the solum: 36 to more than 60 inches

Thickness of the mollic epipedon: 24 to 32 inches

Ap horizon:

Hue—10YR

Value—2

Chroma—1 or 2

Texture—loam

A horizon:

Hue—10YR

Value—2 or 3

Chroma—2

Texture—loam or clay loam

Bw horizon:

Hue—10YR

Value—3 or 4

Chroma—3 or 4

Texture—loam or clay loam

2BC horizon:

Hue—10YR

Value—4 or 5

Chroma—4 to 6

Texture—clay loam

13B—Olmitz-Vesser-Zook complex, 0 to 5 percent slopes

Composition

Olmitz and similar soils: About 35 percent

Vesser and similar soils: About 33 percent

Zook and similar soils: About 25 percent

Inclusions: About 7 percent

Setting

Landform: Upland drainageways

Geomorphic component: Base slopes

Hillslope position: Toeslopes and footslopes

Slope: Olmitz and Vesser—2 to 5 percent; Zook—0 to 5 percent

Component Description

Olmitz

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Local alluvium

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 10.6 inches (high)

Content of organic matter in the surface layer: About 3.5 percent (moderate)

Vesser

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Local alluvium

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.9 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

Zook

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Local alluvium

Flooding: None

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 9.0 inches (high)

Content of organic matter in the surface layer: About 6 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas that have a lighter colored overwash
- Soils that have a subsoil of stratified sandy loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

273B—Olmitz loam, 2 to 5 percent slopes

Composition

Olmitz and similar soils: 100 percent

Setting

Landform: Alluvial fans

Geomorphic component: Base slopes

Hillslope position: Footslopes and toeslopes

Slope: 2 to 5 percent

Component Description

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Loamy alluvium

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 10.6 inches (high)

Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in

this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

5040—Orthents, loamy

Composition

Orthents: Variable

Component Description

Surface layer texture: Loam

Depth to bedrock: Greater than 60 inches

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 6.6 inches (moderate)

Description of the Unit

- This map unit consists of nearly level to steep areas from which soil material has been removed for use in other areas.

Major Uses of the Unit

- Wildlife habitat

For general and detailed information concerning these uses, see Part II of this publication:

- Wildlife Habitat section

Otley Series

Drainage class: Moderately well drained

Permeability: Moderate

Landform: Uplands

Parent material: Loess

Native vegetation: Prairie

Slope range: 2 to 9 percent

Taxadjunct features: The Otley soils in map units 281B2 and 281C2 do not have a mollic epipedon.

Typical Pedon

Otley silty clay loam, 2 to 5 percent slopes. 150 feet

west and 260 feet north of the center of sec. 17, T. 73 N., R. 11 W.

Ap—0 to 10 inches; black (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) dry; weak medium subangular blocky structure parting to weak very fine and fine granular; friable; few fine roots; moderately acid; abrupt smooth boundary.

A—10 to 18 inches; very dark brown (10YR 2/2) and black (10YR 2/1) silty clay loam, brown (10YR 4/3) dry; moderate very fine subangular blocky structure; friable; few fine roots; moderately acid; gradual smooth boundary.

Bt1—18 to 25 inches; brown (10YR 4/3) and very dark grayish brown (10YR 3/2) silty clay loam; moderate very fine and fine subangular blocky structure; friable; few fine roots; common faint clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—25 to 33 inches; brown (10YR 5/3) silty clay loam; moderate fine and medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—33 to 41 inches; pale brown (10YR 6/3) silty clay loam; few medium distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) and few fine distinct grayish brown (10YR 5/2) mottles; moderate fine and medium prismatic structure parting to strong medium angular blocky; firm; few fine roots; common distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Bt4—41 to 57 inches; light brownish gray (2.5Y 6/2) silty clay loam; many coarse prominent strong brown (7.5YR 5/6) and few fine prominent yellowish red (5YR 4/6) mottles; weak medium prismatic structure parting to weak coarse subangular blocky; firm; few fine roots; common distinct clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

C—57 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; many coarse prominent strong brown (7.5YR 5/6) mottles; massive; friable; few prominent very dark grayish brown (10YR 3/2) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; moderately acid.

Range in Characteristics

Thickness of the solum: 48 to 60 inches

Thickness of the mollic epipedon: 10 to 20 inches

A or Ap horizon:

Hue—10YR

Value—2 or 3

Chroma—1 to 3

Texture—silty clay loam

Bt horizon (upper part):

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—3 or 4

Texture—silty clay loam

Bt horizon (lower part):

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—2 to 4

Texture—silty clay loam

C horizon:

Hue—10YR, 2.5Y, or 5Y

Value—5 or 6

Chroma—2 to 8

Texture—silty clay loam or silt loam

281B—Otley silty clay loam, 2 to 5 percent slopes

Composition

Otley and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Interfluvies, head slopes, nose slopes, and side slopes

Hillslope position: Shoulders and summits

Slope: 2 to 5 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 4 to 6 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.9 inches (high)

Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this

map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of eroded soils
- Mahaska and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

281B2—Otley silty clay loam, 2 to 5 percent slopes, moderately eroded

Composition

Otley and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Interfluvies, head slopes, nose slopes, and side slopes

Hillslope position: Shoulders and summits

Slope: 2 to 5 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 4 to 6 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 12.2 inches (high)

Content of organic matter in the surface layer: About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Mahaska and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

281C—Otley silty clay loam, 5 to 9 percent slopes

Composition

Otley and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Shoulders and backslopes

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 4 to 6 feet

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.9 inches (high)

Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Clarinda and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

281C2—Otley silty clay loam, 5 to 9 percent slopes, moderately eroded

Composition

Otley and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Shoulders and backslopes
Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: 4 to 6 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 12.2 inches (high)
Content of organic matter in the surface layer: About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Clarinda and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Perks Series

Drainage class: Excessively drained
Permeability: Rapid

Landform: Flood plains

Parent material: Sandy textured alluvium or local alluvium

Native vegetation: Forest

Slope range: 0 to 2 percent

Typical Pedon

Perks loamy sand, in an area of Nodaway-Klum-Perks complex, 0 to 3 percent slopes, 600 feet north and 63 feet east of the southwest corner of sec. 2, T. 72 N., R. 8 W.

- Ap—0 to 9 inches; brown (10YR 4/3) loamy sand, light brownish gray (10YR 6/2) dry; single grain; loose; few fine roots; strongly acid; abrupt smooth boundary.
- C1—9 to 21 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; few fine roots; strongly acid; gradual smooth boundary.
- C2—21 to 41 inches; brown (10YR 4/3) sand; common medium strata of light brownish gray (10YR 6/2) fine sand; single grain; loose; few fine roots; few distinct dark grayish brown (10YR 4/2) organic coatings throughout; strongly acid; gradual smooth boundary.
- C3—41 to 60 inches; dark yellowish brown (10YR 4/4) sand; few fine distinct yellowish brown (10YR 5/6) mottles; single grain; loose; strongly acid.

Range in Characteristics

Thickness of the solum: 5 to 9 inches

A or Ap horizon:

Hue—10YR
Value—2 to 4
Chroma—1 to 3
Texture—loamy sand

C horizon:

Hue—10YR
Value—4 or 5
Chroma—4 to 6
Texture—sand

139—Perks loamy sand, 1 to 3 percent slopes

Composition

Perks and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Loamy sand
Depth to bedrock: Greater than 60 inches
Drainage class: Excessively drained
Dominant parent material: Sandy textured alluvium
Frequency of flooding: Occasional
Depth to the water table: Greater than 6.0 feet
Available water capacity to 60 inches or root-limiting layer: About 2.3 inches (very low)
Content of organic matter in the surface layer: About 1 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a substratum of silt loam

Major Uses of the Unit

- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Pershing Series

Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Uplands and stream terraces
Parent material: Loess
Native vegetation: Mixed prairie grasses and deciduous trees
Slope range: 2 to 9 percent

Typical Pedon

Pershing silt loam, 2 to 5 percent slopes, 500 feet east and 750 feet south of the center of sec. 35, T. 71 N., R. 11 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.
 E—9 to 15 inches; grayish brown (10YR 5/2) silt loam, pale brown (10YR 6/3) dry; weak medium

platy structure; friable; few fine roots; many distinct light gray (10YR 7/1) silt coatings on faces of peds; neutral; clear smooth boundary.
 BE—15 to 20 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) silty clay loam; weak medium platy structure parting to moderate fine subangular blocky; friable; few fine roots; common distinct light gray (10YR 7/1) silt coatings on faces of peds; slightly acid; clear smooth boundary.

Btg1—20 to 28 inches; grayish brown (2.5Y 5/2) silty clay; common fine prominent yellowish brown (10YR 5/4 and 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; common prominent clay films on faces of peds; very few light gray (10YR 7/1) silt coatings on faces of peds and in pores; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Btg2—28 to 42 inches; grayish brown (2.5Y 5/2) silty clay; common fine and medium prominent yellowish brown (10YR 5/4 and 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds; very few organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Btg3—42 to 54 inches; grayish brown (2.5Y 5/2) silty clay; common fine and medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium and coarse subangular blocky structure; firm; common prominent clay films on faces of peds; very few organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Btg4—54 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium and coarse prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; few faint clay films on faces of peds; very few prominent organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; moderately acid.

Range in Characteristics

Thickness of the solum: 48 to more than 60 inches

Ap horizon:

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silt loam or silty clay loam

E horizon (if it occurs):

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—2

Texture—silt loam

Btg horizon (upper part):

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—2 to 8

Texture—silty clay or silty clay loam

Btg horizon (lower part):

Hue—10YR, 2.5Y, or 5Y

Value—4 to 6

Chroma—1 to 6

Texture—silty clay or silty clay loam

131B—Pershing silt loam, 2 to 5 percent slopes***Composition***

Pershing and similar soils: About 90 percent

Inclusions: About 10 percent

Setting*Landform:* Uplands*Geomorphic component:* Interfluves*Hillslope position:* Summits and shoulders*Slope:* 2 to 5 percent***Component Description****Surface layer texture:* Silt loam*Depth to bedrock:* Greater than 60 inches*Drainage class:* Somewhat poorly drained*Dominant parent material:* Loess*Flooding:* None*Depth to the water table:* 2 to 4 feet*Kind of water table:* Perched*Available water capacity to 60 inches or root-limiting layer:* About 12.1 inches (high)*Content of organic matter in the surface layer:* About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Belinda and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

131B2—Pershing silty clay loam, 2 to 5 percent slopes, moderately eroded***Composition***

Pershing and similar soils: About 95 percent

Inclusions: About 5 percent

Setting*Landform:* Uplands*Geomorphic component:* Interfluves*Hillslope position:* Summits and shoulders*Slope:* 2 to 5 percent***Component Description****Surface layer texture:* Silty clay loam*Depth to bedrock:* Greater than 60 inches*Drainage class:* Somewhat poorly drained*Dominant parent material:* Loess*Flooding:* None*Depth to the water table:* 2 to 4 feet*Kind of water table:* Perched*Available water capacity to 60 inches or root-limiting layer:* About 11.8 inches (high)*Content of organic matter in the surface layer:* About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

131C2—Pershing silty clay loam, 5 to 9 percent slopes, moderately eroded

Composition

Pershing and similar soils: About 85 percent

Inclusions: About 15 percent

Setting

Landform: Uplands

Geomorphic component: Interfluves, nose slopes, head slopes, and side slopes

Hillslope position: Shoulders, summits, and backslopes

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 11.8 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Armstrong and similar soils
- Rinda and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

831B—Pershing silt loam, bench, 2 to 5 percent slopes

Composition

Pershing and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Stream terraces

Geomorphic component: Interfluves, side slopes, nose slopes, and head slopes

Hillslope position: Summits, shoulders, and backslopes

Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 12.1 inches (high)

Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Belinda and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

831C2—Pershing silty clay loam, bench, 5 to 9 percent slopes, moderately eroded

Composition

Pershing and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Stream terraces

Geomorphic component: Side slopes, nose slopes, head slopes, and interfluves

Hillslope position: Shoulders and backslopes

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Somewhat poorly drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 11.8 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a sandy and gravelly subsoil
- Galland and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

5020—Pits and Dumps

Composition

Pits and Dumps: Variable

Description

- This map unit consists of pits and dumps in areas where minerals have been removed.

5030—Pits, limestone quarries

Composition

Pits, limestone quarries: Variable

Description

- This map unit consists of pits from which limestone has been removed.

Richwood Series

Drainage class: Well drained

Permeability: Moderate

Landform: Stream terraces

Parent material: Silty alluvium

Native vegetation: Prairie

Slope range: 0 to 2 percent

Typical Pedon

Richwood silt loam, 0 to 2 percent slopes, 2,200 feet west and 260 feet south of the northeast corner of sec. 13, T. 72 N., R. 8 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine and fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

A—9 to 15 inches; dark brown (10YR 3/3) and very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak very fine and fine subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

BA—15 to 19 inches; dark yellowish brown (10YR 4/4) and brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.

Bt1—19 to 25 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; many distinct brown (10YR 4/3) clay films on faces of peds; neutral; clear smooth boundary.

Bt2—25 to 32 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; many distinct brown (10YR 4/3) clay films on faces of peds; few fine irregular soft masses of iron-manganese; neutral; gradual smooth boundary.

Bt3—32 to 45 inches; yellowish brown (10YR 5/4)

silty clay loam; common fine prominent strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) mottles; weak fine and medium subangular blocky structure; friable; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine irregular soft masses of iron-manganese; neutral; gradual smooth boundary.

BC—45 to 60 inches; yellowish brown (10YR 5/4) silt loam; many fine and medium distinct light brownish gray (10YR 6/2) and few fine prominent strong brown (7.5YR 5/8) mottles; weak medium and coarse subangular blocky structure; friable; few fine roots; few fine irregular soft masses of iron-manganese; neutral.

Range in Characteristics

Thickness of the solum: 40 to more than 60 inches

Thickness of the mollic epipedon: 10 to 17 inches

Depth to stratified sediments: 60 to 72 inches

Ap or A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 to 3

Texture—silt loam

BA horizon:

Hue—10YR

Value—3 to 5

Chroma—3 to 5

Texture—silt loam or silty clay loam

Bt horizon:

Hue—10YR or 7.5YR

Value—3 to 5

Chroma—3 to 5

Texture—silt loam or silty clay loam

BC horizon:

Hue—10YR or 7.5YR

Value—3 to 5

Chroma—3 or 4

Texture—silt loam or loam

977—Richwood silt loam, 0 to 2 percent slopes

Composition

Richwood and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Well drained

Dominant parent material: Silty alluvium

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 12.5 inches (high)

Content of organic matter in the surface layer: About 4 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a subsoil of loam

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Rinda Series

Drainage class: Poorly drained

Permeability: Very slow

Landform: Uplands

Parent material: Loess over gray paleosol weathered from glacial till

Native vegetation: Mixed prairie grasses and deciduous trees

Slope range: 5 to 9 percent

Typical Pedon

Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded, 2,430 feet south and 100 feet east of the northwest corner of sec. 4, T. 73 N., R. 10 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; about 30 percent streaks and pockets of dark grayish brown (10YR 4/2) subsoil material; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

BE—8 to 13 inches; dark grayish brown (10YR 4/2) silty clay loam; about 10 percent mixings of very dark grayish brown (10YR 3/2) material from the surface layer; moderate fine subangular blocky structure; friable; few fine roots; very few prominent white (10YR 8/1) silt coatings on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; clear smooth boundary.

Btg1—13 to 17 inches; dark grayish brown (10YR 4/2) silty clay; many fine distinct yellowish brown (10YR 5/4) and prominent yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds and in pores; few prominent white (10YR 8/1) silt coatings on faces of peds; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds and in root channels; few fine irregular soft masses of iron-manganese; strongly acid; clear smooth boundary.

2Btg2—17 to 24 inches; dark grayish brown (2.5Y 4/2) clay; many fine prominent yellowish brown (10YR 5/4 and 5/6) mottles; moderate fine and medium subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds and in pores; common distinct very dark grayish brown (2.5Y 3/2) organic coatings on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

2Btg3—24 to 34 inches; dark grayish brown (2.5Y 4/2) clay; few fine prominent yellowish brown (10YR 5/4) mottles; moderate fine and medium subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds and in pores; few distinct very dark grayish brown (2.5Y 3/2) organic coatings on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

2Btg4—34 to 43 inches; olive gray (5Y 5/2) clay; few fine prominent yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds and in pores; few intersecting slickensides on horizontal faces of peds; few fine irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

2Btg5—43 to 60 inches; gray (5Y 5/1) clay; few fine prominent yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; very firm; few fine roots; many

prominent clay films on faces of peds and in pores; few intersecting slickensides on horizontal faces of peds; few fine irregular soft masses of iron-manganese; neutral.

Range in Characteristics

Thickness of the solum: 42 to more than 60 inches

Ap horizon:

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silty clay loam

BE horizon:

Hue—10YR or 2.5Y

Value—4 or 5

Chroma—2

Texture—silty clay loam or silty clay

Bt horizon:

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—1 or 2

Texture—silty clay loam or silty clay

2Bt horizon:

Hue—10YR to 5Y

Value—4 to 6

Chroma—1 or 2

Texture—clay or silty clay

223C2—Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded

Composition

Rinda and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Loess over gray paleosol weathered from glacial till

Flooding: None

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 9.5 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Armstrong and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Rubio Series

Drainage class: Poorly drained

Permeability: Slow

Landform: Upland flats

Parent material: Loess

Native vegetation: Mixed prairie grasses and deciduous trees

Slope range: 0 to 2 percent

Typical Pedon

Rubio silt loam, 0 to 2 percent slopes, 560 feet north and 180 feet west of the center of sec. 16, T. 72 N., R. 10 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak very fine and fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

E—8 to 16 inches; gray (10YR 5/1) silt loam, light gray (10YR 7/1) dry; weak medium platy structure parting to weak very fine subangular blocky; friable; few fine roots; few distinct silt coatings on faces of peds; strongly acid; clear smooth boundary.

Btg1—16 to 22 inches; dark gray (10YR 4/1) silty clay loam; few fine prominent brownish yellow

(10YR 6/6) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds and in pores; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Btg2—22 to 31 inches; dark gray (10YR 4/1) silty clay; common fine prominent yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; common distinct clay films on faces of peds and in pores; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Btg3—31 to 39 inches; olive gray (5Y 5/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; few fine roots; common distinct clay films on faces of peds and in pores; very few prominent very dark gray (10YR 3/1) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Btg4—39 to 47 inches; olive gray (5Y 5/2) silty clay loam; common fine and medium prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; few fine roots; few distinct clay films on faces of peds and in pores; few prominent very dark gray (10YR 3/1) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

BCg—47 to 60 inches; olive gray (5Y 5/2) silty clay loam; common fine and medium prominent yellowish brown (10YR 5/8) and strong brown (7.5YR 5/8) mottles; weak medium prismatic structure; friable; few fine roots; few prominent very dark gray (10YR 3/1) organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; slightly acid.

Range in Characteristics

Thickness of the solum: 42 to more than 60 inches

Ap horizon:

Hue—10YR

Value—3

Chroma—1 or 2

Texture—silt loam

E horizon:

Hue—10YR
Value—4 or 5
Chroma—1 or 2
Texture—silt loam

Btg horizon (upper part):

Hue—10YR to 5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay loam

Btg horizon (lower part):

Hue—5Y
Value—4 to 6
Chroma—2
Texture—silty clay loam or silty clay

BCg horizon:

Hue—5Y
Value—4 or 5
Chroma—2
Texture—silty clay loam

74—Rubio silt loam, 0 to 2 percent slopes

Composition

Rubio and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Upland flats
Geomorphic component: Divides
Hillslope position: Summits
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Loess
Flooding: None
Seasonal high water table: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 10.6 inches (high)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this

map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Givin and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Shelby Series

Drainage class: Well drained

Permeability: Moderately slow

Landform: Uplands

Parent material: Glacial till

Native vegetation: Prairie

Slope range: 9 to 14 percent

Taxadjunct features: The Shelby soils in this county do not have a mollic epipedon.

Typical Pedon

Shelby clay loam, 9 to 14 percent slopes, moderately eroded, 2,568 feet east and 485 feet north of the southwest corner of sec. 24, T. 73 N., R. 11 W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) clay loam, dark gray (10YR 4/1) dry; about 30 percent streaks and pockets of brown (10YR 4/3) subsoil material; weak fine granular structure; friable; few fine roots; about 1 percent pebbles; strongly acid; abrupt smooth boundary.

BA—8 to 16 inches; brown (10YR 4/3) clay loam; weak very fine and fine subangular blocky structure; friable; few fine roots; common distinct very dark gray (10YR 3/1) organic coatings on faces of peds; about 1 percent pebbles; strongly acid; clear smooth boundary.

Bt1—16 to 22 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine and medium subangular blocky structure; firm; few fine roots; few faint clay films on faces of peds; about 1 percent pebbles; strongly acid; gradual smooth boundary.

Bt2—22 to 35 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky

structure; firm; few fine roots; common faint clay films on faces of peds; about 1 percent pebbles; strongly acid; gradual smooth boundary.

Bt3—35 to 45 inches; brown (10YR 5/3) clay loam; few fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; many faint clay films on faces of peds; few fine irregular soft masses of iron-manganese; about 1 percent pebbles; strongly acid; gradual smooth boundary.

BC—45 to 60 inches; brown (10YR 5/3) clay loam; common fine faint grayish brown (10YR 5/2) and few fine and medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; weak coarse prismatic structure; firm; few fine roots; few fine irregular soft masses of iron-manganese; about 1 percent pebbles; strongly acid.

Range in Characteristics

Thickness of the solum: 30 to more than 60 inches
Depth to carbonates: 40 to more than 60 inches

Ap or A horizon:

Hue—10YR
 Value—2 or 3
 Chroma—1 to 3
 Texture—clay loam

BA or Bt horizon (upper part):

Hue—10YR
 Value—3 or 4
 Chroma—3 or 4
 Texture—clay loam

Bt horizon (lower part):

Hue—10YR
 Value—4 or 5
 Chroma—3 to 6
 Texture—clay loam

BC horizon:

Hue—10YR or 2.5Y
 Value—3 to 5
 Chroma—2 or 3
 Texture—clay loam

24D2—Shelby clay loam, 9 to 14 percent slopes, moderately eroded

Composition

Shelby and similar soils: About 85 percent
 Inclusions: About 15 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 9 to 14 percent

Component Description

Surface layer texture: Clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Well drained

Dominant parent material: Glacial till

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 10.2 inches (high)

Content of organic matter in the surface layer: About 2.7 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Adair and similar soils
- Clarinda and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Sparta Series

Drainage class: Excessively drained

Permeability: Rapid

Landform: Uplands and stream terraces

Parent material: Eolian sand

Native vegetation: Prairie

Slope range: 2 to 5 percent

Typical Pedon

Sparta loamy fine sand, 2 to 5 percent slopes, 2,200 feet west and 80 feet south of the northeast corner of sec. 13, T. 72 N., R. 8 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak very fine and fine granular structure; very friable; few fine roots; strongly acid; abrupt smooth boundary.

AB—9 to 20 inches; dark brown (10YR 3/3) loamy fine sand, grayish brown (10YR 5/2) dry; single grain; loose; few fine roots; slightly acid; gradual smooth boundary.

Bw—20 to 30 inches; dark yellowish brown (10YR 4/4) loamy sand; single grain; loose; few fine roots; slightly acid; gradual smooth boundary.

C—30 to 60 inches; dark yellowish brown (10YR 4/6) sand; single grain; loose; slightly acid.

Range in Characteristics

Thickness of the solum: 24 to 45 inches

Thickness of the mollic epipedon: 10 to 22 inches

Ap horizon:

Hue—10YR or 7.5YR

Value—2 or 3

Chroma—1 or 2

Texture—loamy fine sand

AB horizon:

Hue—10YR or 7.5YR

Value—3 or 4

Chroma—2 or 3

Texture—loamy fine sand or loamy sand

Bw horizon:

Hue—10YR or 7.5YR

Value—3 to 6

Chroma—3 to 6

Texture—loamy fine sand, loamy sand, fine sand, or sand

C horizon:

Hue—10YR or 7.5YR

Value—4 to 6

Chroma—3 to 6

Texture—sand or fine sand

41B—Sparta loamy fine sand, 2 to 5 percent slopes

Composition

Sparta and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Uplands and stream terraces

Geomorphic component: Interfluvies, nose slopes, and side slopes

Hillslope position: Summits, shoulders, and backslopes

Slope: 2 to 5 percent

Component Description

Surface layer texture: Loamy fine sand

Depth to bedrock: Greater than 60 inches

Drainage class: Excessively drained

Dominant parent material: Eolian sand

Flooding: None

Depth to the water table: Greater than 6.0 feet

Available water capacity to 60 inches or root-limiting layer: About 4.6 inches (low)

Content of organic matter in the surface layer: About 1.5 percent (moderately low)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have less sand in the profile than the Sparta soil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Sperry Series

Drainage class: Very poorly drained

Permeability: Slow

Landform: Upland depressions

Parent material: Loess

Native vegetation: Prairie

Slope range: 0 to 1 percent

Typical Pedon

Sperry silt loam, 0 to 1 percent slopes, 1,480 feet south and 150 feet west of the northeast corner of sec. 8, T. 73 N., R. 10 W.

A—0 to 10 inches; very dark gray (10YR 3/1) silt loam, dark gray (10YR 4/1) dry; weak fine

granular structure; friable; moderately acid; clear smooth boundary.

E—10 to 18 inches; dark gray (10YR 4/1) silt loam; weak fine subangular blocky structure; friable; few fine irregular soft masses of iron-manganese; slightly acid; abrupt smooth boundary.

Btg1—18 to 30 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) mottles; strong fine subangular blocky structure; firm; common distinct clay films on faces of peds and in pores; very dark gray (10YR 3/1) organic coatings on faces of peds; moderately acid; gradual smooth boundary.

Btg2—30 to 35 inches; gray (10YR 5/1) silty clay; many fine and medium distinct yellowish brown (10YR 5/6 and 5/8) mottles; moderate fine and medium subangular blocky structure; firm; common distinct clay films on faces of peds; moderately acid; gradual smooth boundary.

Btg3—35 to 42 inches; gray (10YR 5/1) silty clay loam; many fine and medium prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium subangular blocky structure; firm; common distinct clay films on faces of peds; slightly acid; gradual smooth boundary.

BCg—42 to 52 inches; light olive gray (5Y 6/2) and olive gray (5Y 5/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6 and 5/8) mottles; weak medium prismatic structure parting to weak and moderate medium subangular blocky; friable; few distinct very dark gray (10YR 3/1) clay films in pores and on faces of peds; slightly acid; gradual smooth boundary.

Cg—52 to 60 inches; light olive gray (5Y 6/2) and olive gray (5Y 5/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6 and 5/8) mottles; massive; few distinct very dark gray (10YR 3/1) clay films in pores; slightly acid.

Range in Characteristics

Thickness of the solum: 40 to 60 inches

Thickness of the mollic epipedon: 10 to 16 inches

A or Ap horizon:

Hue—10YR

Value—2 or 3

Chroma—1

Texture—silt loam

E horizon:

Hue—10YR

Value—4 or 5

Chroma—1 or 2

Texture—silt loam

Btg horizon:

Hue—10YR, 2.5Y, or 5Y

Value—3 to 5

Chroma—1

Texture—silty clay loam or silty clay

BCg or Cg horizon:

Hue—2.5Y or 5Y

Value—5 or 6

Chroma—1 or 2

Texture—silty clay loam

122—Sperry silt loam, 0 to 1 percent slopes

Composition

Sperry and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Upland depressions

Geomorphic component: Divides

Hillslope position: Summits

Slope: 0 to 1 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Very poorly drained

Dominant parent material: Loess

Flooding: None

Seasonal high water table: 1 foot above to 1 foot below the surface

Kind of water table: Apparent

Ponding duration: Long

Available water capacity to 60 inches or root-limiting layer: About 11.7 inches (high)

Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Taintor and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Taintor Series

Drainage class: Poorly drained

Permeability: Moderately slow

Landform: Upland flats

Parent material: Loess

Native vegetation: Prairie

Slope range: 0 to 2 percent

Typical Pedon

Taintor silty clay loam, 0 to 2 percent slopes, 130 feet north and 105 feet east of the southwest corner of sec. 4, T. 73 N., R. 11 W.

- Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; friable; few fine roots; neutral; abrupt smooth boundary.
- A1—8 to 16 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak very fine and fine subangular blocky structure; friable; few fine roots; neutral; gradual smooth boundary.
- A2—16 to 22 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; moderate medium subangular blocky structure; firm; few fine roots; common distinct black (10YR 2/1) organic coatings on faces of peds and in pores; few fine and medium irregular wormcasts; slightly acid; clear smooth boundary.
- Btg1—22 to 26 inches; dark gray (10YR 4/1) silty clay; few fine prominent yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; common prominent clay films on faces of peds and in pores; common distinct very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; clear smooth boundary.
- Btg2—26 to 32 inches; dark gray (5Y 4/1) and dark gray (10YR 4/1) silty clay; few fine prominent yellowish brown (10YR 5/6 and 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds and in pores; few fine rounded soft masses of iron-manganese; neutral; gradual smooth boundary.
- Btg3—32 to 36 inches; gray (5Y 5/1) and dark gray (10YR 4/1) silty clay; common fine prominent yellowish brown (10YR 5/6) and few fine

prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds and in pores; few fine rounded soft masses of iron-manganese; neutral; gradual smooth boundary.

Btg4—36 to 46 inches; olive gray (5Y 5/2) silty clay loam; few fine faint light olive gray (5Y 6/2) and few fine prominent strong brown (7.5YR 5/8) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common distinct clay films on faces of peds and in pores; few distinct dark gray (10YR 4/1) organic coatings in root channels and pores; few fine rounded soft masses of iron-manganese; neutral; gradual smooth boundary.

BCg—46 to 55 inches; olive gray (5Y 5/2) silty clay loam; few fine prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8) mottles; weak medium prismatic structure; friable; few fine roots; few distinct dark gray (10YR 4/1) organic coatings in root channels and pores; few fine rounded soft masses of iron-manganese; neutral; gradual smooth boundary.

Cg—55 to 60 inches; grayish brown (2.5Y 5/2) silt loam; common medium prominent strong brown (7.5YR 5/8) mottles; massive; friable; few fine roots; few distinct dark gray (10YR 4/1) organic coatings in root channels and pores; neutral.

Range in Characteristics

Thickness of the solum: 42 to 60 inches

Thickness of the mollic epipedon: 16 to 24 inches

Ap or A horizon:

Hue—10YR or neutral

Value—2 or 3

Chroma—0 or 1

Texture—silty clay loam

Btg horizon:

Hue—10YR, 2.5Y, or 5Y

Value—4 or 5

Chroma—1 or 2

Texture—silty clay or silty clay loam

Cg horizon:

Hue—10YR, 2.5Y, or 5Y

Value—4 to 6

Chroma—1 or 2

Texture—silty clay loam or silt loam

279—Taintor silty clay loam, 0 to 2 percent slopes

Composition

Taintor and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Upland flats

Geomorphic component: Divides

Hillslope position: Summits

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Loess

Flooding: None

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.3 inches (high)

Content of organic matter in the surface layer: About 5.5 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Sperry and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Tuskeego Series

Drainage class: Poorly drained

Permeability: Very slow

Landform: Stream terraces

Parent material: Silty alluvium

Native vegetation: Mixed prairie grasses and deciduous trees

Slope range: 0 to 2 percent

Typical Pedon

Tuskeego silt loam, 0 to 2 percent slopes, 380 feet north and 1,540 feet east of the center of sec. 31, T. 72 N., R. 10 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine and medium subangular blocky structure parting to weak fine granular; friable; few fine roots; strongly acid; abrupt smooth boundary.

E1—9 to 14 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common fine and medium prominent strong brown (7.5YR 5/6) mottles; weak medium platy structure parting to weak very fine subangular blocky; friable; few fine roots; many distinct silt coatings on faces of peds; very strongly acid; gradual smooth boundary.

E2—14 to 18 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common fine and medium prominent strong brown (7.5YR 5/6) mottles; weak medium platy structure parting to weak very fine subangular blocky; friable; few fine roots; common distinct silt coatings on faces of peds; very strongly acid; clear smooth boundary.

Btg1—18 to 21 inches; gray (10YR 5/1) silty clay loam; common fine and medium prominent strong brown (7.5YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; many clay films on faces of peds and in pores; few distinct silt coatings on faces of peds; very strongly acid; clear smooth boundary.

Btg2—21 to 30 inches; gray (10YR 5/1) silty clay; common fine and medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds and in pores; few fine irregular soft masses of iron-manganese; very strongly acid; gradual smooth boundary.

Btg3—30 to 37 inches; grayish brown (2.5Y 5/2) silty clay; many fine and medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds and in pores; few fine irregular soft masses of iron-manganese; very strongly acid; gradual smooth boundary.

Btg4—37 to 46 inches; grayish brown (2.5Y 5/2) silty clay; many fine and medium prominent strong brown (7.5YR 5/6 and 5/8) mottles; weak medium and coarse subangular blocky structure; very firm; few fine roots; common distinct clay films on faces of peds and in pores; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

BC—46 to 60 inches; gray (5Y 5/1) silty clay loam; few fine prominent yellowish brown (10YR 5/4) and few fine and medium prominent strong brown (7.5YR 5/8) mottles; weak medium and coarse subangular blocky structure; firm; few fine irregular soft masses of iron-manganese; moderately acid.

Range in Characteristics

Thickness of the solum: 48 to more than 60 inches

Ap or A horizon:

Hue—10YR
Value—3
Chroma—1 or 2
Texture—silt loam

E horizon:

Hue—10YR
Value—4 to 6
Chroma—1 or 2
Texture—silt loam

Btg horizon (upper part):

Hue—10YR or 2.5Y
Value—4 or 5
Chroma—1 or 2
Texture—silty clay loam or silty clay

Btg horizon (lower part):

Hue—10YR to 5Y
Value—3 to 5
Chroma—1 or 2
Texture—silty clay loam or silty clay

BC horizon:

Hue—10YR to 5Y
Value—3 to 5
Chroma—1 or 2
Texture—silty clay loam

453—Tuskeego silt loam, 0 to 2 percent slopes

Composition

Tuskeego and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Stream terraces

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Silty alluvium

Frequency of flooding: Rare

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 11.4 inches (high)

Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Zook and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Vesser Series

Drainage class: Somewhat poorly drained or poorly drained

Permeability: Moderate

Landform: Flood plains, upland drainageways, and alluvial fans

Parent material: Silty alluvium or local alluvium

Native vegetation: Prairie

Slope range: 0 to 5 percent

Typical Pedon

Vesser silt loam, 0 to 2 percent slopes, 2,180 feet north and 1,200 feet west of the southeast corner of sec. 21, T. 73 N., R. 9 W.

- Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) dry; weak fine subangular blocky structure parting to weak fine granular; friable; few very fine and fine roots; moderately acid; abrupt smooth boundary.
- E1—10 to 15 inches; dark gray (10YR 4/1) silt loam, light brownish gray (10YR 6/2) dry; common fine distinct yellowish brown (10YR 5/4) mottles; weak thick platy structure parting to moderate fine subangular blocky; friable; few prominent light gray (10YR 7/1) silt coatings on faces of peds; few faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds and in pores; very strongly acid; clear smooth boundary.
- E2—15 to 25 inches; gray (10YR 5/1) silt loam, light brownish gray (10YR 6/2) dry; common fine distinct brown (10YR 4/3) and yellowish brown (10YR 5/4) mottles; weak thick platy structure parting to moderate fine subangular blocky; friable; few fine roots; few prominent light gray (10YR 7/1) silt coatings on faces of peds; very strongly acid; clear smooth boundary.
- Btg1—25 to 31 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine brown (10YR 4/3) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; few faint clay films on faces of peds and in pores; few prominent light gray (10YR 7/1) silt coatings on faces of peds; few prominent dark gray (5Y 4/1) organic coatings on faces of peds and in root channels; very strongly acid; clear smooth boundary.
- Btg2—31 to 40 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine yellowish brown (10YR 5/6 and 5/8) mottles; weak fine prismatic structure; firm; few fine roots; common faint clay films on faces of peds; few prominent dark gray (5Y 4/1) organic coatings on faces of peds and in root channels; very strongly acid; gradual smooth boundary.
- Btg3—40 to 52 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine yellowish brown (10YR 5/6 and 5/8) mottles; weak medium prismatic structure; firm; few fine roots; few faint clay films on faces of peds; few prominent dark gray (5Y 4/1) organic coatings on faces of peds and in root channels; very strongly acid; gradual smooth boundary.
- BCg—52 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine and medium yellowish brown (10YR 5/6 and 5/8) mottles; weak medium prismatic structure; firm; few fine roots; very few prominent dark gray (5Y 4/1) organic coatings on faces of peds and in root channels; strongly acid.

Range in Characteristics

Thickness of the solum: More than 60 inches
Thickness of the mollic epipedon: 10 to 15 inches

Ap horizon:

Hue—10YR
 Value—2 or 3
 Chroma—1 or 2
 Texture—silt loam

E horizon:

Hue—10YR
 Value—3 to 5
 Chroma—1 or 2
 Texture—silt loam

Btg horizon:

Hue—10YR or 2.5Y
 Value—4 or 5
 Chroma—1 or 2
 Texture—silty clay loam

BCg horizon:

Hue—10YR or 2.5Y
 Value—4 or 5
 Chroma—1 or 2
 Texture—silty clay loam

51—Vesser silt loam, 0 to 2 percent slopes

Composition

Vesser and similar soils: About 90 percent
 Inclusions: About 10 percent

Setting

Landform: Flood plains
Slope: 0 to 2 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Poorly drained
Dominant parent material: Silty alluvium
Frequency of flooding: Occasional
Seasonal high water table: At the surface to 1 foot below the surface
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.9 inches (high)
Content of organic matter in the surface layer: About 3.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in

this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas of stratified sandy loam
- Areas that have a lighter colored overwash

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

51B—Vesser silt loam, 2 to 5 percent slopes

Composition

Vesser and similar soils: About 95 percent
Inclusions: About 5 percent

Setting

Landform: Alluvial fans
Geomorphic component: Base slopes
Hillslope position: Footslopes
Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Somewhat poorly drained
Dominant parent material: Silty alluvium
Flooding: None
Depth to the water table: 2 to 4 feet
Kind of water table: Apparent
Available water capacity to 60 inches or root-limiting layer: About 11.9 inches (high)
Content of organic matter in the surface layer: About 3 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas that have a lighter colored overwash

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

Weller Series

Drainage class: Moderately well drained
Permeability: Slow
Landform: Uplands and stream terraces
Parent material: Loess
Native vegetation: Forest
Slope range: 2 to 14 percent

Typical Pedon

Weller silt loam, 2 to 5 percent slopes, 143 feet north and 1,200 feet east of the southwest corner of sec. 29, T. 71 N., R. 10 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine and fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

E—7 to 11 inches; brown (10YR 5/3) silt loam; weak medium platy structure parting to weak fine subangular blocky; friable; few fine roots; many distinct silt coatings on faces of peds; neutral; clear smooth boundary.

BE—11 to 14 inches; yellowish brown (10YR 5/4) and brown (10YR 5/3) silty clay loam; weak fine subangular blocky structure; friable; few fine roots; many distinct silt coatings on faces of peds; strongly acid; abrupt wavy boundary.

Bt1—14 to 22 inches; dark yellowish brown (10YR 4/4) and grayish brown (10YR 5/2) silty clay; few fine prominent strong brown (7.5YR 5/6) and few medium distinct yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; very firm; few fine roots; many prominent clay films on faces of peds; few fine irregular soft masses of iron-manganese; strongly acid; gradual smooth boundary.

Bt2—22 to 28 inches; brown (10YR 5/3) and grayish brown (10YR 5/2) silty clay; common fine prominent strong brown (7.5YR 5/6) and few medium distinct yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; very firm; few fine roots; many distinct clay films on faces of peds; few fine irregular soft

masses of iron-manganese; moderately acid; gradual smooth boundary.

Bt3—28 to 37 inches; brown (10YR 5/3) and grayish brown (10YR 5/2) silty clay loam; few medium prominent strong brown (7.5YR 5/6) and few distinct yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; many prominent clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

Bt4—37 to 44 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6) and distinct yellowish brown (10YR 5/4) mottles; weak fine and medium subangular blocky structure; firm; few fine roots; common prominent clay films on faces of peds; few fine irregular soft masses of iron-manganese; moderately acid; gradual smooth boundary.

Bt5—44 to 53 inches; light brownish gray (10YR 6/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6) and common medium distinct yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; friable; few faint clay films on faces of peds; few faint organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; slightly acid; gradual smooth boundary.

C—53 to 60 inches; light brownish gray (10YR 6/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6) and common medium distinct yellowish brown (10YR 5/4) mottles; massive; friable; few faint organic coatings in root channels and pores; few fine irregular soft masses of iron-manganese; slightly acid.

Range in Characteristics

Thickness of the solum: 48 to 60 inches

Ap or A horizon:

Hue—10YR

Value—4 or 5

Chroma—1 to 3

Texture—silt loam or silty clay loam

E horizon:

Hue—10YR

Value—4 or 5

Chroma—2 or 3

Texture—silt loam

BE horizon:

Hue—10YR

Value—4 or 5

Chroma—4

Texture—silty clay loam

Bt horizon (upper part):

Hue—10YR

Value—4 or 5

Chroma—4

Texture—silty clay or silty clay loam

Bt horizon (lower part):

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—2 to 6

Texture—silty clay or silty clay loam

C horizon:

Hue—10YR or 2.5Y

Value—4 to 6

Chroma—2 to 6

Texture—silty clay loam or silt loam

132B—Weller silt loam, 2 to 5 percent slopes

Composition

Weller and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Interfluves

Hillslope position: Summits and shoulders

Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 10.8 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

• Beckwith and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

132C—Weller silt loam, 5 to 9 percent slopes

Composition

Weller and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, side slopes, and interfluves

Hillslope position: Shoulders, summits, and backslopes

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 10.8 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ashgrove and similar soils
- Keswick and similar soils

Major Uses of the Unit

- Cropland
- Hayland

- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

132C2—Weller silty clay loam, 5 to 9 percent slopes, moderately eroded

Composition

Weller and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands

Geomorphic component: Head slopes, nose slopes, side slopes, and interfluves

Hillslope position: Shoulders and backslopes

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 10.8 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Ashgrove and similar soils
- Keswick and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

132D—Weller silt loam, 9 to 14 percent slopes

Composition

Weller and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silt loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: 2 to 4 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches (high)
Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Keswick and similar soils
- Areas of eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

132D2—Weller silty clay loam, 9 to 14 percent slopes, moderately eroded

Composition

Weller and similar soils: About 90 percent
Inclusions: About 10 percent

Setting

Landform: Uplands
Geomorphic component: Head slopes, nose slopes, and side slopes
Hillslope position: Backslopes
Slope: 9 to 14 percent

Component Description

Surface layer texture: Silty clay loam
Depth to bedrock: Greater than 60 inches
Drainage class: Moderately well drained
Dominant parent material: Loess
Flooding: None
Depth to the water table: 2 to 4 feet
Kind of water table: Perched
Available water capacity to 60 inches or root-limiting layer: About 10.7 inches (high)
Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the “Soil Properties” section in Part II of this publication.

Inclusions

- Keswick and similar soils
- Areas of severely eroded soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

832B—Weller silt loam, bench, 2 to 5 percent slopes

Composition

Weller and similar soils: About 95 percent

Inclusions: About 5 percent

Setting

Landform: Stream terraces

Geomorphic component: Interfluves, side slopes, nose slopes, and head slopes

Hillslope position: Summits, shoulders, and backslopes

Slope: 2 to 5 percent

Component Description

Surface layer texture: Silt loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 10.8 inches (high)

Content of organic matter in the surface layer: About 2.5 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Beckwith and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

832C2—Weller silty clay loam, bench, 5 to 9 percent slopes, moderately eroded

Composition

Weller and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Stream terraces

Geomorphic component: Side slopes, nose slopes, head slopes, and interfluves

Hillslope position: Shoulders and backslopes

Slope: 5 to 9 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 10.8 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a sandy and gravelly subsoil
- Galland and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

832D2—Weller silty clay loam, bench, 9 to 14 percent slopes, moderately eroded

Composition

Weller and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Stream terraces

Geomorphic component: Head slopes, nose slopes, and side slopes

Hillslope position: Backslopes

Slope: 9 to 14 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Moderately well drained

Dominant parent material: Loess

Flooding: None

Depth to the water table: 2 to 4 feet

Kind of water table: Perched

Available water capacity to 60 inches or root-limiting layer: About 10.7 inches (high)

Content of organic matter in the surface layer: About 2 percent (moderate)

A typical soil series description with range in characteristics is included, in alphabetical order, in this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Soils that have a sandy and gravelly subsoil
- Galland and similar soils

Major Uses of the Unit

- Cropland
- Hayland
- Pasture
- Forest land

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section
- Forest Land section

Zook Series

Drainage class: Poorly drained

Permeability: Slow

Landform: Flood plains and upland drainageways

Parent material: Silty alluvium or local alluvium

Native vegetation: Prairie

Slope range: 0 to 5 percent

Typical Pedon

Zook silty clay loam, 0 to 2 percent slopes, 1,700 feet north and 230 feet west of the southeast corner of sec. 27, T. 72 N., R. 11 W.

Ap—0 to 7 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; weak very fine and fine subangular blocky structure parting to weak fine granular; firm; few fine roots; moderately acid; clear smooth boundary.

A1—7 to 18 inches; black (N 2/0) silty clay loam, very dark gray (10YR 3/1) dry; moderate fine and medium granular structure; friable; few fine roots; moderately acid; gradual smooth boundary.

A2—18 to 37 inches; black (N 2/0) silty clay, very dark gray (10YR 3/1) dry; moderate medium subangular blocky structure; very firm; few fine roots; moderately acid; gradual smooth boundary.

Bg—37 to 53 inches; black (5Y 2/1) silty clay, dark gray (5Y 4/1) dry; moderate medium subangular blocky structure; very firm; few fine roots; slightly acid; gradual smooth boundary.

Cg—53 to 60 inches; very dark gray (5Y 3/1) silty clay, gray (5Y 5/1) dry; few fine prominent light brownish gray (2.5Y 6/2) mottles; massive; very firm; few fine roots; slightly acid.

Range in Characteristics

Thickness of the solum: 36 to more than 60 inches

Thickness of the mollic epipedon: 36 to more than 50 inches

A horizon:

Hue—10YR or neutral

Value—2

Chroma—0 or 1

Texture—silty clay loam

Bg horizon:

Hue—10YR to 5Y

Value—2 to 5

Chroma—1

Texture—silty clay

Cg horizon:

Hue—10YR to 5Y

Value—2 to 5

Chroma—1

Texture—silty clay

54—Zook silty clay loam, 0 to 2 percent slopes

Composition

Zook and similar soils: About 90 percent

Inclusions: About 10 percent

Setting

Landform: Flood plains

Slope: 0 to 2 percent

Component Description

Surface layer texture: Silty clay loam

Depth to bedrock: Greater than 60 inches

Drainage class: Poorly drained

Dominant parent material: Silty alluvium

Frequency of flooding: Occasional

Seasonal high water table: At the surface to 1 foot below the surface

Kind of water table: Apparent

Available water capacity to 60 inches or root-limiting layer: About 9.3 inches (high)

Content of organic matter in the surface layer: About 6 percent (high)

A typical soil series description with range in characteristics is included, in alphabetical order, in

this section. Additional information specific to this map unit, such as horizon depth and textures, is available in the "Soil Properties" section in Part II of this publication.

Inclusions

- Areas that have a lighter colored overwash
- Soils that have a higher content of clay in the subsoil

Major Uses of the Unit

- Cropland
- Hayland
- Pasture

For general and detailed information concerning these uses, see Part II of this publication:

- Agronomy section

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The geomorphic component that forms

the steepest inclined surface and principal element of many hillslopes (fig. 8). Backslopes in profile are commonly steep and linear and descend to a footslope. In terms of gradational process, backslopes are erosional forms produced mainly by mass wasting and running water.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills. It consists of a concave surface at the bottom of hillslopes that is underlain by colluvial and slope-wash materials or forms a colluvial apron or wedge; a three-dimensional analog of a footslope. Distal base slope sediments commonly grade into, interfinger with, or are buried by alluvial fills.

Beach deposits. Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a postglacial or glacial lake.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor

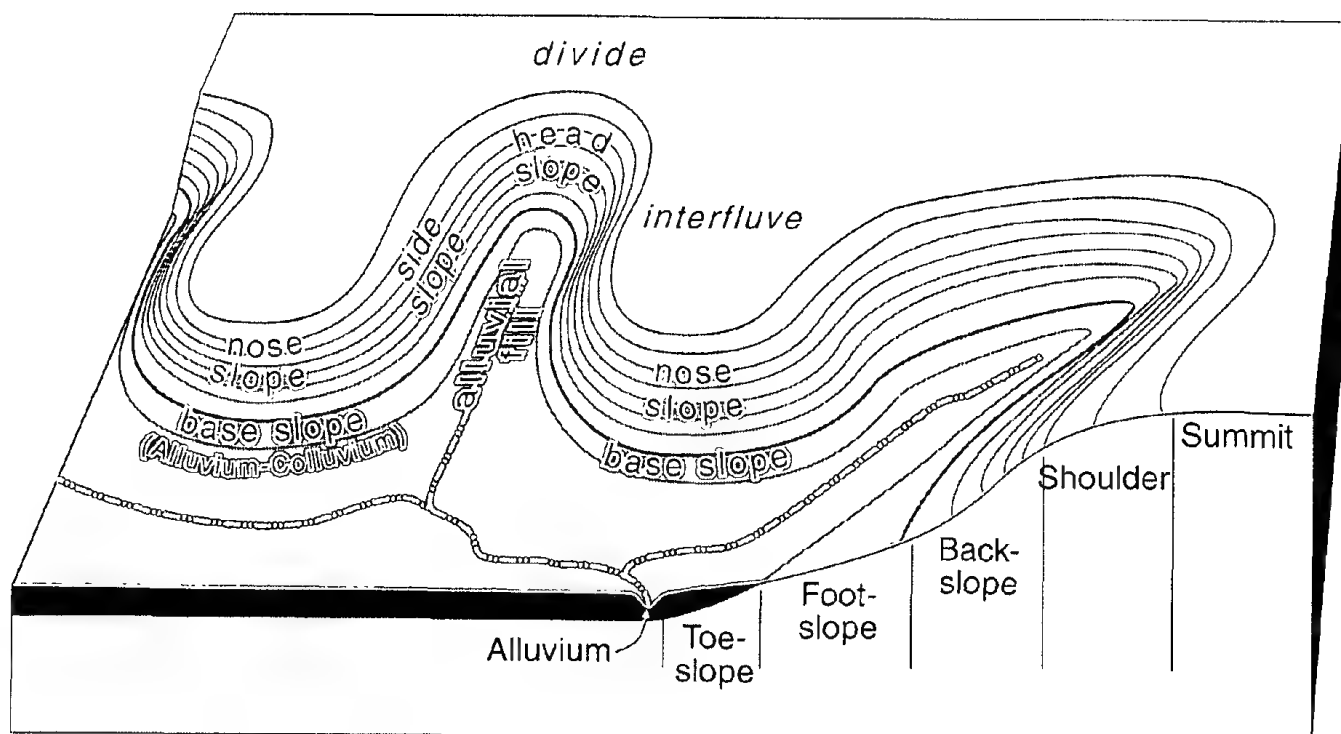


Figure 8.—Landscape relationship of geomorphic components and hillslope positions (modified after Ruhe and Walker, 1968).

formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channery soil material. Soil material that is, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a chanter.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is

unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the surface after planting in order to reduce the hazard of water erosion; in areas where wind erosion is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or its equivalent during the critical erosion period.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming).

Growing crops in strips that follow the contour.

Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divide. (a) The line of separation, or (b) the summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins; it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of

artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained.—These soils have an intermediate or high water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of most field crops are affected. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted under natural conditions. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poor drainage is caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except for rice) under natural conditions.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and

includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than 1 mile to more than 100 miles in length and from 10 to 100 feet in height.

Excess fines (in tables). Excess silt and clay in the

soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is generally a constructional landform consisting of sediment deposited during overflow and lateral migration of the stream.

Footslope. The geomorphic component that forms

the inner, gently inclined surface at the base of a hillslope. The surface is dominantly concave. In terms of gradational processes, a footslope is a transition zone between an upslope site of erosion (backslope) and a downslope site of deposition (toeslope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Geomorphology. The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial

meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded strip cropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Head slope. The concave surface at the head of a drainageway where the flow of water converges downward toward the center and contour lines form concave curves.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-chroma zones. Zones having chroma of 3 or more. Typical color in areas of iron concentrations.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 6 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the

inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Ice-walled lake plain. A relict surface marking the floor of an extinct lake basin that was formed on solid ground and surrounded by stagnant ice in a stable or unstable superglacial environment on stagnation moraines. As the ice melted the lake plain became perched above the adjacent landscape. The lake plain is well sorted, generally fine textured, stratified deposits.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not

a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluvium. A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron concentrations. High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made

by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame moraine. An end moraine that contains numerous kames. A group of kames along the front of a stagnant glacier, commonly comprising the slumped remnants of a formerly continuous outwash plain built up over the foot of rapidly wasting or stagnant ice.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake bed. The bottom of a lake; a lake basin.

Lake plain. A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lakeshore. A narrow strip of land in contact with or bordering a lake; especially the beach of a lake.

Lake terrace. A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil,

including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. The projecting end of an interfluvium, where contour lines connecting the opposing side slopes form convex curves around the projecting end and lines perpendicular to the contours diverge downward. Overland flow of water is divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent

Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Parts per million (ppm). The concentration of a substance in the soil, such as phosphorus or potassium, in one million parts of air-dried soil on a weight per weight basis.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Extremely slow	less than 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

Phosphorus. The amount of phosphorus available to plants at a depth of 30 to 42 inches is expressed in parts per million and based on the weighted

average of air-dried soil samples. Terms describing the amount of available phosphorus are:

Very low	less than 7.5 ppm
Low	7.5 to 13.0 ppm
Medium	13.0 to 22.5 ppm
High	more than 22.5 ppm

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitted outwash plain. An outwash plain marked by many irregular depressions, such as kettles, shallow pits, and potholes, which formed by melting of incorporated ice masses; many are found in Wisconsin and Minnesota.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potassium. The amount of potassium available to plants at a depth of 12 to 24 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available potassium are:

Very low	less than 50 ppm
Low	50 to 79 ppm

Medium	79 to 125 ppm
High	more than 125 ppm

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth).

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Burning an area under conditions of weather and soil moisture and at the time of day that will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	less than 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features

indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck

has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The hillslope position that forms the uppermost inclined surface near the top of a hillslope. It comprises the transition zone from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. The slope bounding a drainageway and lying between the drainageway and the adjacent interfluvium. It is generally linear along the slope

width, and overland flow is parallel down the slope.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small

stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stagnation moraine. A body of drift released by the melting of a glacier that ceased flowing. Commonly but not always occurs near ice margins; composed of till, ice-contact stratified drift, and small areas of glacial lake sediment. Typical landforms are knob-and-kettle topography, locally including ice-walled lake plains.

Stone line. A concentration of rock fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Strippcropping. Growing crops in a systematic arrangement of strips or bands that provide

vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that restricts roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope profile and exhibiting a nearly level surface. A general term for the top, or highest level, of a landform such as a hill, mountain, or tableland. It usually refers to a high interfluvial area of gentler slope that is flanked by steeper hillslopes, for example, mountain fronts or tableland escarpments.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Swale. A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine due to uneven glacial deposition.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive, arcuate ridge or complex of ridges underlain by till and other types of drift.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Till plain. An extensive area of nearly level to undulating or gently sloping soils that are underlain by till or consist of till. Slopes are 0 to 6 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The outermost inclined surface at the base of a hill. Toeslopes are commonly gentle and linear in profile.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as salts, that severely hinder

establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variagation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.



United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
Iowa Agriculture and
Home Economics
Experiment Station;
Cooperative Extension
Service, Iowa State
University; and Division of
Soil Conservation, Iowa
Department of Agriculture
and Land Stewardship

Soil Survey of Jefferson County, Iowa

Part II



How to Use This Soil Survey

This survey is divided into three parts. Part I includes general information about the survey area; descriptions of the general soil map units, detailed soil map units, and soil series in the area; and a description of how the soils formed. Part II describes the use and management of the soils and the major soil properties. This part may be updated as further information about soil management becomes available. Part III includes the maps.

On the **general soil map**, the survey area is divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** in Part I of this survey for a general description of the soils in your area.

The **detailed soil maps** can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet, and turn to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** in Part I of this survey, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** in Part II shows which table has data on a specific land use for each detailed soil map unit. See the **Contents** in Part I and Part II for other sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1992. Soil names and descriptions were approved in 1992. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1992. This survey was made cooperatively by the Natural Resources Conservation Service; the Iowa Agriculture and Home Economics Experiment Station; the Cooperative Extension Service, Iowa State University; and the Division of Soil Conservation, Iowa Department of Agriculture and Land Stewardship. The survey is part of the technical assistance furnished to the Jefferson County Soil and Water Conservation District. Funds appropriated by Jefferson County were used to defray part of the cost of the survey.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Cover: Contour farming, erosion-control structures, and terraces are common conservation practices in Jefferson County.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service home page on the World Wide Web. The address is <http://www.nrcs.usda.gov> (click on "Technical Resources").

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Soil Survey of Jefferson County, Iowa

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Interpretive ratings help engineers, planners, and others understand how soil properties influence important nonagricultural uses, such as building site development and construction materials. The ratings indicate the most restrictive soil features affecting the suitability of the soils for these uses.

Soils are rated in their natural state. No unusual

modification of the soil site or material is made other than that which is considered normal practice for the rated use. Even though soils may have limitations, it is important to remember that engineers and others can modify soil features or can design or adjust the plans for a structure to compensate for most of the limitations. Most of these practices, however, are costly. The final decision in selecting a site for a particular use generally involves weighing the costs of site preparation and maintenance.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

The classification and extent of the soils in this survey area are shown in the tables "Classification of the Soils" and "Acreage and Proportionate Extent of the Soils," which are at the end of this section.

Classification of the Soils

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics that are outside the range of the series)

Soil name	Family or higher taxonomic class
Ackmore-----	Aeric Fluvaquents, fine-silty, mixed, nonacid, mesic
Ainsworth-----	Typic Hapludalfs, fine, montmorillonitic, mesic
*Arispe-----	Aquic Argiudolls, fine, montmorillonitic, mesic
Armstrong-----	Aquollic Hapludalfs, fine, montmorillonitic, mesic
Ashgrove-----	Aeric Ochraqualfs, fine, montmorillonitic, mesic, sloping
Beckwith-----	Typic Albaqualfs, fine, montmorillonitic, mesic
Belinda-----	Mollic Albaqualfs, fine, montmorillonitic, mesic
Bucknell-----	Udollic Ochraqualfs, fine, montmorillonitic, mesic, sloping
Cantril-----	Udollic Ochraqualfs, fine-loamy, mixed, mesic
Chelsea-----	Alfic Udipsamments, mixed, mesic
Chequest-----	Typic Haplaquolls, fine, montmorillonitic, mesic
Clarinda-----	Typic Argiaquolls, fine, montmorillonitic, mesic, sloping
Clinton-----	Typic Hapludalfs, fine, montmorillonitic, mesic
Colo-----	Cumulic Haplaquolls, fine-silty, mixed, mesic
Coppock-----	Mollic Ochraqualfs, fine-silty, mixed, mesic
Douds-----	Typic Hapludalfs, fine-loamy, mixed, mesic
Edina-----	Typic Argialbolls, fine, montmorillonitic, mesic
Fayette-----	Typic Hapludalfs, fine-silty, mixed mesic
Galland-----	Aquic Hapludalfs, fine, montmorillonitic, mesic
Gara-----	Mollic Hapludalfs, fine-loamy, mixed, mesic
Givin-----	Udollic Ochraqualfs, fine, montmorillonitic, mesic
Gosport-----	Typic Dystrochrepts, fine, illitic, mesic
Grundy-----	Aquic Argiudolls, fine, montmorillonitic, mesic
Haig-----	Typic Argiaquolls, fine, montmorillonitic, mesic
Hedrick-----	Mollic Hapludalfs, fine-silty, mixed, mesic
Inton-----	Typic Hapludalfs, fine-silty, mixed mesic
Kalona-----	Typic Haplaquolls, fine, montmorillonitic, mesic
Keomah-----	Aeric Ochraqualfs, fine, montmorillonitic, mesic
Keswick-----	Aquic Hapludalfs, fine, montmorillonitic, mesic
Klum-----	Mollic Udifluvents, coarse-loamy, mixed, nonacid, mesic
Ladoga-----	Mollic Hapludalfs, fine, montmorillonitic, mesic
*Lamoni-----	Aquic Argiudolls, fine, montmorillonitic, mesic
Lindley-----	Typic Hapludalfs, fine-loamy, mixed, mesic
Mahaska-----	Aquic Argiudolls, fine, montmorillonitic, mesic
*Nira-----	Typic Hapludolls, fine-silty, mixed, mesic
Nodaway-----	Mollic Udifluvents, fine-silty, mixed, nonacid, mesic
Nordness-----	Lithic Hapludalfs, loamy, mixed, mesic
Okaw-----	Typic Albaqualfs, fine, montmorillonitic, mesic
Olmitz-----	Cumulic Hapludolls, fine-loamy, mixed, mesic
Orthents-----	Orthents
Otley-----	Typic Argiudolls, fine, montmorillonitic, mesic
Perks-----	Typic Udipsamments, mixed, mesic
Pershing-----	Aquollic Hapludalfs, fine, montmorillonitic, mesic
Richwood-----	Typic Argiudolls, fine-silty, mixed, mesic
Rinda-----	Mollic Ochraqualfs, fine, montmorillonitic, mesic, sloping
Rubio-----	Mollic Albaqualfs, fine, montmorillonitic, mesic
*Shelby-----	Typic Argiudolls, fine-loamy, mixed, mesic
Sparta-----	Entic Hapludolls, sandy, mixed, mesic
Sperry-----	Typic Argialbolls, fine, montmorillonitic, mesic
Taintor-----	Typic Argiaquolls, fine, montmorillonitic, mesic
Tuskeego-----	Mollic Ochraqualfs, fine, montmorillonitic, mesic
Vesser-----	Argiaquic Argialbolls, fine-silty, mixed, mesic
Weller-----	Aquic Hapludalfs, fine, montmorillonitic, mesic
Zook-----	Cumulic Haplaquolls, fine, montmorillonitic, mesic

Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
13B	Olmitz-Vesser-Zook complex, 0 to 5 percent slopes-----	8,290	2.9
23C2	Arispe silty clay loam, 5 to 9 percent slopes, moderately eroded-----	1,500	0.5
24D2	Shelby clay loam, 9 to 14 percent slopes, moderately eroded-----	1,780	0.6
41B	Sparta loamy fine sand, 2 to 5 percent slopes-----	130	*
51	Vesser silt loam, 0 to 2 percent slopes-----	1,230	0.4
51B	Vesser silt loam, 2 to 5 percent slopes-----	390	0.1
54	Zook silty clay loam, 0 to 2 percent slopes-----	810	0.3
65D2	Lindley loam, 9 to 14 percent slopes, moderately eroded-----	4,240	1.5
65E	Lindley loam, 14 to 18 percent slopes-----	2,210	0.8
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded-----	7,360	2.6
65F2	Lindley loam, 18 to 25 percent slopes, moderately eroded-----	1,370	0.5
65G	Lindley loam, 25 to 40 percent slopes-----	7,560	2.7
74	Rubio silt loam, 0 to 2 percent slopes-----	470	0.2
75	Givin silt loam, 0 to 2 percent slopes-----	1,600	0.6
75B	Givin silt loam, 2 to 5 percent slopes-----	3,590	1.3
76B	Ladoga silt loam, 2 to 5 percent slopes-----	4,190	1.5
76C2	Ladoga silty clay loam, 5 to 9 percent slopes, moderately eroded-----	8,360	3.0
76D2	Ladoga silty clay loam, 9 to 14 percent slopes, moderately eroded-----	200	*
80B	Clinton silt loam, 2 to 5 percent slopes-----	2,160	0.8
80C2	Clinton silty clay loam, 5 to 9 percent slopes, moderately eroded-----	9,410	3.3
80D2	Clinton silty clay loam, 9 to 14 percent slopes, moderately eroded-----	3,380	1.2
87B	Colo-Zook complex, 0 to 5 percent slopes-----	200	*
122	Sperry silt loam, 0 to 1 percent slopes-----	410	0.1
130	Belinda silt loam, 0 to 2 percent slopes-----	1,100	0.4
131B	Pershing silt loam, 2 to 5 percent slopes-----	5,200	1.8
131B2	Pershing silty clay loam, 2 to 5 percent slopes, moderately eroded-----	320	0.1
131C2	Pershing silty clay loam, 5 to 9 percent slopes, moderately eroded-----	6,330	2.3
132B	Weller silt loam, 2 to 5 percent slopes-----	3,190	1.1
132C	Weller silt loam, 5 to 9 percent slopes-----	430	0.2
132C2	Weller silty clay loam, 5 to 9 percent slopes, moderately eroded-----	9,140	3.2
132D	Weller silt loam, 9 to 14 percent slopes-----	280	*
132D2	Weller silty clay loam, 9 to 14 percent slopes, moderately eroded-----	3,830	1.4
139	Perks loamy sand, 1 to 3 percent slopes-----	200	*
179D2	Gara clay loam, 9 to 14 percent slopes, moderately eroded-----	4,350	1.5
179E2	Gara clay loam, 14 to 18 percent slopes, moderately eroded-----	1,260	0.4
180	Keomah silt loam, 0 to 2 percent slopes-----	200	*
180B	Keomah silt loam, 2 to 5 percent slopes-----	410	0.1
208	Klum fine sandy loam, 0 to 2 percent slopes-----	440	0.2
211	Edina silt loam, depressional, 0 to 1 percent slopes-----	80	*
220	Nodaway silt loam, 0 to 2 percent slopes-----	7,320	2.6
222C	Clarinda silty clay loam, 5 to 9 percent slopes-----	830	0.3
222C2	Clarinda silty clay loam, 5 to 9 percent slopes, moderately eroded-----	7,820	2.8
223C2	Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded-----	10,050	3.6
260	Beckwith silt loam, 0 to 2 percent slopes-----	530	0.2
263	Okaw silt loam, 0 to 2 percent slopes-----	250	*
264B	Ainsworth silt loam, 2 to 5 percent slopes-----	270	*
273B	Olmitz loam, 2 to 5 percent slopes-----	210	*
279	Taintor silty clay loam, 0 to 2 percent slopes-----	15,400	5.5
280	Mahaska silty clay loam, 0 to 2 percent slopes-----	7,390	2.6
280B	Mahaska silty clay loam, 2 to 5 percent slopes-----	13,450	4.8
281B	Otley silty clay loam, 2 to 5 percent slopes-----	6,200	2.2
281B2	Otley silty clay loam, 2 to 5 percent slopes, moderately eroded-----	850	0.3
281C	Otley silty clay loam, 5 to 9 percent slopes-----	330	0.1
281C2	Otley silty clay loam, 5 to 9 percent slopes, moderately eroded-----	5,970	2.1
293C	Chelsea-Fayette complex, 5 to 9 percent slopes-----	260	*
293F	Chelsea-Fayette complex, 18 to 25 percent slopes-----	430	0.2
313E2	Gosport silty clay loam, 14 to 18 percent slopes, moderately eroded-----	260	*
313G	Gosport silty clay loam, 25 to 40 percent slopes-----	350	0.1
315	Nodaway-Klum-Perks complex, 0 to 3 percent slopes-----	410	0.1
362	Haig silt loam, 0 to 2 percent slopes-----	14,560	5.2
363	Haig silty clay loam, 0 to 1 percent slopes-----	350	0.1

See footnote at end of table.

Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	Percent
364B	Grundy silty clay loam, 2 to 5 percent slopes-----	8,520	3.0
364B2	Grundy silty clay loam, 2 to 5 percent slopes, moderately eroded-----	1,740	0.6
423D2	Bucknell silty clay loam, 9 to 14 percent slopes, moderately eroded-----	4,750	1.7
424D2	Lindley-Keswick complex, 9 to 14 percent slopes, moderately eroded-----	1,500	0.5
424E2	Lindley-Keswick complex, 14 to 18 percent slopes, moderately eroded-----	1,690	0.6
425D	Keswick loam, 9 to 14 percent slopes-----	450	0.2
425D2	Keswick clay loam, 9 to 14 percent slopes, moderately eroded-----	1,460	0.5
430	Ackmore silt loam, 0 to 2 percent slopes-----	660	0.2
453	Tuskego silt loam, 0 to 2 percent slopes-----	270	*
499G	Nordness silt loam, 25 to 40 percent slopes-----	240	*
520	Coppock silt loam, 0 to 2 percent slopes-----	2,140	0.8
520B	Coppock silt loam, 2 to 5 percent slopes-----	1,920	0.7
570C2	Nixa silty clay loam, 5 to 9 percent slopes, moderately eroded-----	6,960	2.5
571C2	Hedrick silty clay loam, 5 to 9 percent slopes, moderately eroded-----	6,240	2.2
572C2	Inton silty clay loam, 5 to 9 percent slopes, moderately eroded-----	1,270	0.5
572D2	Inton silty clay loam, 9 to 14 percent slopes, moderately eroded-----	570	0.2
587	Chequest silty clay loam, 0 to 2 percent slopes-----	890	0.3
594D2	Galland clay loam, 9 to 14 percent slopes, moderately eroded-----	1,440	0.5
729	Nodaway-Coppock complex, 0 to 2 percent slopes-----	1,300	0.5
730B	Nodaway-Coppock-Cantril complex, 2 to 5 percent slopes-----	3,880	1.4
779	Kalona silty clay loam, 0 to 1 percent slopes-----	1,600	0.6
792C2	Armstrong clay loam, 5 to 9 percent slopes, moderately eroded-----	200	*
792D2	Armstrong clay loam, 9 to 14 percent slopes, moderately eroded-----	570	0.2
795C2	Ashgrove silty clay loam, 5 to 9 percent slopes, moderately eroded-----	1,280	0.5
795D2	Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded-----	7,320	2.6
822D2	Lamoni silty clay loam, 9 to 14 percent slopes, moderately eroded-----	430	0.2
831B	Pershing silt loam, bench, 2 to 5 percent slopes-----	490	0.2
831C2	Pershing silty clay loam, bench, 5 to 9 percent slopes, moderately eroded-----	380	0.1
832B	Weller silt loam, bench, 2 to 5 percent slopes-----	1,110	0.4
832C2	Weller silty clay loam, bench, 5 to 9 percent slopes, moderately eroded-----	2,030	0.7
832D2	Weller silty clay loam, bench, 9 to 14 percent slopes, moderately eroded-----	380	0.1
876B	Ladoga silt loam, bench, 2 to 5 percent slopes-----	200	*
876C2	Ladoga silty clay loam, bench, 5 to 9 percent slopes, moderately eroded-----	300	0.1
880B	Clinton silt loam, bench, 2 to 5 percent slopes-----	510	0.2
880C2	Clinton silty clay loam, bench, 5 to 9 percent slopes, moderately eroded-----	2,070	0.7
880D2	Clinton silty clay loam, bench, 9 to 14 percent slopes, moderately eroded-----	650	0.2
977	Richwood silt loam, 0 to 2 percent slopes-----	290	0.1
993D2	Gara-Armstrong complex, 9 to 14 percent slopes, moderately eroded-----	1,650	0.6
993E2	Gara-Armstrong complex, 14 to 18 percent slopes, moderately eroded-----	320	0.1
994D2	Galland-Douds complex, 9 to 14 percent slopes, moderately eroded-----	760	0.3
994E2	Galland-Douds complex, 14 to 18 percent slopes, moderately eroded-----	900	0.3
1075B	Givin silt loam, bench, 2 to 5 percent slopes-----	260	*
1130	Belinda silt loam, bench, 0 to 2 percent slopes-----	220	*
1260	Beckwith silt loam, bench, 0 to 2 percent slopes-----	270	*
1715	Nodaway-Vesser-Ackmore complex, 0 to 2 percent slopes-----	7,210	2.6
5020	Pits and Dumps-----	50	*
5030	Pits, limestone quarries-----	140	*
5040	Orthents, loamy-----	160	*
	Water-----	570	0.2
	Total-----	281,300	100.0

* Less than 0.1 percent.

Agronomy

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Natural Resources Conservation Service is explained, and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider obtaining specific information from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Cropland Management Considerations

The management concerns affecting the use of the detailed soil map units in the survey area for crops are shown in the table "Cropland Management Considerations." The main concerns in managing nonirrigated cropland are conserving moisture, controlling wind erosion and water erosion, and maintaining soil fertility.

Conserving moisture consists primarily of reducing the evaporation and runoff rates and increasing the water intake rate. Applying conservation tillage and conservation cropping systems, farming on the contour, stripcropping, establishing field windbreaks, and leaving crop residue on the surface conserve moisture.

Generally, a combination of several practices is needed to control *wind erosion* and *water erosion*. Conservation tillage, stripcropping, field windbreaks, contour farming, conservation cropping systems, crop residue management, terraces, diversions, and grassed waterways help to prevent excessive soil loss.

Measures that are effective in maintaining *soil fertility* include applying fertilizer, both organic and inorganic, including manure; incorporating crop residue or green manure crops into the soil; and using proper crop rotations. Controlling erosion helps to prevent the loss of organic matter and plant nutrients and thus helps to maintain productivity, although the level of fertility can be reduced even in

areas where erosion is controlled. All soils used for nonirrigated crops respond well to applications of fertilizer.

Some of the considerations shown in the table cannot be easily overcome. These are *channels*, *flooding*, *gullies*, and *ponding*.

Additional considerations are as follows:

Lime content, limited available water capacity, potential poor tilth and compaction, and restricted permeability.—These limitations can be minimized by incorporating green manure crops, manure, or crop residue into the soil; applying a system of conservation tillage; and using conservation cropping systems. Also, crops may respond well to additions of phosphate fertilizer to soils that have a high content of lime.

Potential for ground-water contamination.—The proper use of nutrients and pesticides can reduce the risk of ground-water contamination.

Potential for surface-water contamination.—The risk of surface-water contamination can be reduced by the proper use of nutrients and pesticides and by conservation farming practices that reduce the runoff rate.

Surface crusting.—This limitation retards seedling development after periods of heavy rainfall.

Surface rock fragments.—This limitation causes rapid wear of tillage equipment. It cannot be easily overcome.

Surface stones.—Stones or boulders on or near the surface can hinder normal tillage unless they are removed.

Salt content.—In areas where this is a limitation, only salt-tolerant crops should be grown.

On irrigated soils the main management concerns are *efficient water use*, *nutrient management*, *control of erosion*, *pest and weed control*, and *timely planting and harvesting* for a successful crop. An irrigation system that provides optimum control and distribution of water at minimum cost is needed. Overirrigation wastes water, leaches plant nutrients, and causes erosion. Also, it can create drainage problems, raise the water table, and increase soil salinity.

Explanation of Criteria

Acid soil.—The pH is less than 6.1.

Channeled.—The word “channeled” is included in the map unit name.

Dense layer.—The bulk density is 1.80 g/cc or greater within the soil profile.

Depth to rock.—The depth to bedrock is less than 40 inches.

Eroded.—The word “eroded” is included in the map unit name.

Excessive permeability.—Permeability is 6 inches per hour or more within the soil profile.

Flooding.—Flooding is occasional or frequent.

Gullied.—The word “gullied” is included in the map unit name.

High organic matter content.—The surface layer has more than 20 percent organic matter.

Lime content.—The pH is 7.4 or more in the surface layer, or the wind erodibility group is 4L.

Limited available water capacity.—The available water capacity calculated to a depth of 60 inches or to a root-limiting layer is 6 inches or less.

Limited organic matter content.—The content of organic matter is 2 percent or less in the surface layer.

Ponding.—Ponding duration is assigned to the map unit component. The water table is above the surface.

Potential poor tilth and compaction.—The content of clay is 27 percent or more in the surface layer.

Potential for ground-water contamination (by nutrients or pesticides).—Depth to the water table is 4 feet or less, the permeability of any layer is more than 6.0 inches per hour, or the depth to bedrock is less than 60 inches.

Potential for surface-water contamination (by nutrients or pesticides).—The map unit component is occasionally flooded or frequently flooded, is subject to ponding, is assigned to hydrologic group C or D and has a slope of more than 2 percent, is assigned to hydrologic group A and has a slope of more than 6 percent, or is assigned to hydrologic group B, has a slope of 3 percent or more, and has a K factor of more than 0.17.

Restricted permeability.—Permeability is less than 0.06 inch per hour within the soil profile.

Salt content.—The electrical conductivity is 4 or more in the surface layer or 8 or more within a depth of 30 inches.

Slope (equipment limitation).—The slope is more than 15 percent.

Surface crusting.—The content of clay is 27 percent or more and the content of organic matter is 2 percent or less in the surface layer.

Surface rock fragments (equipment limitation).—The terms describing the texture of the surface layer include any rock fragment modifier, except for gravelly, channery, stony, very stony, extremely stony, bouldery, very bouldery, and extremely bouldery.

Surface stones (equipment limitation).—The word “stony” or “bouldery” is included in the map unit name or in the description of the surface layer.

Water erosion.—Either the slope is 6 percent or more, or the slope is more than 3 percent and less than 6 percent and the surface layer is not sandy.

Water table.—A water table is within 2.5 feet of the surface.

Wind erosion.—The wind erodibility group is 1, 2, 3, or 4L.

Agronomic Considerations

Inherent subsoil fertility levels, in terms of potential plant-available phosphorus and potassium, are described in the table “Agronomic Considerations” at the end of this section. Soil tests of the tilled layer are used to determine the most profitable rates of fertilizers for various crops. Nutrient levels in the subsurface layers do influence crop yields, particularly in the drier seasons when the nutrients in the dry tilled layer become temporarily unavailable to plants. The availability of nutrients in the tilled layer and the subsoil influences the relative uptake from the two zones in the soil profile. Fertilizer recommendations based on soil tests of the tilled layer may be adjusted by the average nutrient levels in the subsoil of each soil series. Fertilizer recommendations are adjusted for subsoil nutrient levels. The ratings given in the table are described as follows:

Subsoil phosphorus.—The amount of plant-available phosphorus in the subsoil expressed in parts per million and based on the weighted average of air-dried soil samples from the subsoil (at a depth of 30 to 42 inches). (The value listed for complexes is the most limiting value of the soils identified in the map unit name.) A rating of *very low* indicates less than 7.5 ppm; *low*, 7.5 to 13.0 ppm; *medium*, 13.0 to 22.5 ppm; and *high*, more than 22.5 ppm.

Subsoil potassium.—The amount of plant-available potassium in the subsoil expressed in parts per million and based on the weighted average of air-dried soil samples from the subsoil (at a depth of 12 to 24 inches). (The value listed for complexes is the most limiting value of the soils identified in the map unit name.) A rating of *very low minus* indicates less than 25 ppm; *very low plus*, 25 to 50 ppm; *low*, 50 to

79 ppm; *medium*, 79 to 125 ppm; and *high*, more than 125 ppm.

Tilth rating.—This rating is based on clay content, organic matter content, drainage class, sand size, and sand content. A rating of 1 indicates good tilth; 2, fair; 3, poor; and 4, very poor.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or for engineering purposes.

In the capability system, soils generally are grouped at three levels—capability class, subclass, and unit (USDA, 1961). These categories indicate the degree and kinds of limitations affecting mechanized farming systems that produce the more commonly grown field crops, such as corn, small grain, cotton, hay, and field-grown vegetables. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by numerals 1 through 8. The numerals indicate progressively greater limitations and narrower choices for practical use.

If properly managed, soils in classes 1, 2, 3, and 4 are suitable for the mechanized production of commonly grown field crops and for pasture and woodland. The degree of the soil limitations affecting the production of cultivated crops increases progressively from class 1 to class 4. The limitations can affect levels of production and the risk of permanent soil deterioration caused by erosion and other factors.

Soils in classes 5, 6, and 7 are generally not suited to the mechanized production of commonly grown field crops without special management, but they are suitable for plants that provide a permanent cover, such as grasses and trees. The severity of the soil limitations affecting crops increases progressively from class 5 to class 7.

Areas in class 8 are generally not suitable for crops, pasture, or woodland without a level of

management that is impractical. These areas may have potential for other uses, such as recreational facilities and wildlife habitat.

Capability subclasses identify the dominant kind of limitation in the class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, 2*e*. The letter *e* shows that the main hazard is the risk of erosion unless a close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

There are no subclasses in class 1 because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use mainly to pasture, woodland, wildlife habitat, or recreation.

The capability classification of each map unit is given in the tables "Land Capability, Corn Suitability Rating, and Yields per Acre of Crops" and "Land Capability and Yields per Acre of Crops and Pasture" at the end of this section.

Corn Suitability Rating (CSR)

The corn suitability rating for the soils in the survey area is given in the table "Land Capability, Corn Suitability Rating, and Yields per Acre of Crops." Corn suitability ratings provide a relative ranking of all soils mapped in the State of Iowa based on their potential to be utilized for the intensive production of row crops. The CSR is an index that can be used to rate the potential production of one soil compared with another over a period of time. The CSR considers average weather conditions and frequency of use of the soil for row crops. Ratings range from 100 for soils that have no physical limitations, are on minimal slopes, and can be continuously row cropped to as low as 5 for soils that have severe limitations affecting the production of row crops. The ratings listed in this table assume adequate management, natural weather conditions (no irrigation), artificial drainage where required, and no land leveling or terracing. They also assume that soils in the lower positions on the landscape are not affected by frequent damaging floods. The weighted CSR for a given field can be modified by the occurrence of sandy spots, local deposits, rock and gravel

outcrops, field boundaries, and noncrossable drainageways. Even though predicted average yields will change with time, the CSR's are expected to remain relatively constant in relation to one another.

The CSR's in Jefferson County range from 95 for map unit 280, Mahaska silty clay loam, 0 to 2 percent slopes, to 5 for several map units, including 313G, Gosport silty clay loam, 25 to 40 percent slopes. No ratings are provided for miscellaneous areas because of the variability of properties and use of these areas.

Crop Yield Estimates

The average yields per acre that can be expected of the principal crops under a high level of management are shown in the tables "Land Capability, Corn Suitability Rating, and Yields per Acre of Crops" and "Land Capability and Yields per Acre of Crops and Pasture." In any given year, yields may be higher or lower than those indicated in the tables because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the tables.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in the tables are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about the

management and productivity of the soils for those crops.

Pasture and Hayland Interpretations

Under good management, proper grazing is essential for the production of high-quality forage, stand survival, and erosion control. Proper grazing helps plants to maintain sufficient and generally vigorous top growth during the growing season. Brush control is essential in many areas, and weed control generally is needed. Rotation grazing and renovation also are important management practices.

Yield estimates are often provided in animal unit months (AUM), or the amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

The local office of the Natural Resources Conservation Service or of the Cooperative Extension Service can provide information about forage yields other than those shown in the tables.

Prime Farmland

Prime farmland is of major importance in meeting the Nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, State, and Federal levels, as well as individuals, must encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to food, feed, forage, fiber, and oilseed crops. Such soils have properties that favor the economic production of sustained high yields of crops. The soils need only to be treated and managed by acceptable farming methods. An adequate moisture supply and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal expenditure of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be used as cropland, pasture, or woodland or for other purposes. They either are used for food and fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public

buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water-control structures. Public land is land not available for farming in National forests, National parks, military reservations, and State parks.

Prime farmland soils commonly receive an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable, and the level of acidity or alkalinity and the content of salts and sodium are acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods, and they are not frequently flooded during the growing season or are protected from flooding. Slopes range mainly from 0 to 6 percent.

Soils that have a high water table or are subject to flooding may qualify as prime farmland where these limitations are overcome by drainage measures or flood control. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information about the criteria for prime farmland can be obtained at the local office of the Natural Resources Conservation Service.

A recent trend in land use has been the conversion of prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

About 116,000 acres, or nearly 41 percent of the survey area, would meet the requirements for prime farmland if adequately drained and protected from flooding.

The map units in the survey area that meet the requirements for prime farmland are listed in the table "Prime Farmland." This list does not constitute a recommendation for a particular land use. On some soils included in the table, measures that overcome limitations are needed. The need for these measures is indicated in parentheses after the map unit name. The location of each map unit is shown on the detailed soil maps. The soil qualities that affect use and management are described in the section "Soil Series and Detailed Soil Map Units."

Erosion Factors

Soil erodibility (K) and soil-loss tolerance (T) factors are used in an equation that predicts the amount of soil lost through water erosion in areas of cropland. The procedure for predicting soil loss is useful in guiding the selection of soil and water conservation practices. The erosion factors for the

soils in the survey area are listed in the table "Physical Properties of the Soils."

Soil Erodibility (K) Factor

The soil erodibility (K) factor indicates the susceptibility of a soil to sheet and rill erosion by water. The soil properties that influence erodibility are those that affect the infiltration rate, the movement of water through the soil, and the water storage capacity of the soil and those that allow the soil to resist dispersion, splashing, abrasion, and the transporting forces of rainfall and runoff. The most important soil properties are the content of silt plus very fine sand, the content of sand coarser than very fine sand, the content of organic matter, soil structure, and permeability.

Fragment-Free Soil Erodibility (K_f) Factor

This is one of the factors used in the revised Universal Soil Loss Equation. It shows the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Soil-Loss Tolerance (T) Factor

The soil-loss tolerance (T) factor is an estimate of the maximum annual rate of soil erosion that can occur over a sustained period without affecting crop productivity. The rate is expressed in tons of soil loss per acre per year. Ratings of 1 to 5 are used, depending on soil properties and prior erosion. The criteria used in assigning a T factor to a soil include maintenance of an adequate rooting depth for crop production, potential reduction of crop yields, maintenance of water-control structures affected by sedimentation, prevention of gullying, and the value of nutrients lost through erosion.

Wind Erodibility Groups

Wind erodibility is directly related to the percentage of dry, nonerodible surface soil aggregates larger than 0.84 millimeter in diameter. From this percentage, the wind erodibility index (I) factor is determined. This factor is an expression of the stability of the soil aggregates, or the extent to which they are broken down by tillage and the abrasion caused by windblown soil particles. Soils are assigned to wind erodibility groups (WEG) having similar percentages of dry soil aggregates larger than 0.84 millimeter. The wind erodibility groups and wind

erodibility index numbers are listed in the table "Physical Properties of the Soils."

Additional information about wind erodibility groups and K, Kf, T, and I factors can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Windbreaks are often planted on land that did not originally support trees. Knowledge of how trees perform on such land can be gained only by observing and recording the performance of trees that have been planted and have survived. Many popular windbreak species are not indigenous to the areas in which they are planted.

Each tree or shrub species has certain climatic and physiographic limits. Within these parameters, a tree or shrub may grow well or grow poorly, depending on the characteristics of the soil. Each tree or shrub has definable potential heights in a given physiographic area and under a given climate. Accurate definitions of potential heights are necessary when a windbreak is planned and designed.

The table "Windbreaks and Environmental Plantings" shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in this table are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for

trees and shrubs can be obtained from local offices of the Natural Resources Conservation Service or the Cooperative Extension Service or from a nursery.

Windbreak Suitability Groups

Windbreak suitability groups consist of soils in which the kinds and degrees of the hazards and limitations that affect the survival and growth of trees and shrubs in windbreaks are about the same. The windbreak suitability group for each soil in the survey area is listed in the table "Windbreak Suitability Groups" at the end of this section. The following paragraphs explain the characteristics of the soils in each group.

Group 1 consists of soils that are somewhat poorly drained or moderately well drained, are rapidly permeable to moderately slowly permeable, and do not have free carbonates in the upper 20 inches.

Group 1K consists of soils that are somewhat poorly drained or moderately well drained, are rapidly permeable to moderately slowly permeable, and have free carbonates within 20 inches of the surface. These soils may be very slightly saline or slightly saline (the electrical conductivity is 2 to 8).

Group 2 consists of poorly drained soils that have been artificially drained and do not have free carbonates in the upper 20 inches. Permeability varies.

Group 2K consists of poorly drained or very poorly drained soils that have been artificially drained and have free carbonates within 20 inches of the surface. Permeability varies. These soils may be very slightly saline or slightly saline (the electrical conductivity is 2 to 8).

Group 2H consists of very poorly drained soils that have been artificially drained and have more than 16 inches of organic material. Permeability varies.

Group 2W consists of very poorly drained soils that are subject to ponding and have been artificially drained. It includes soils that have an organic surface layer up to 16 inches thick. Permeability varies.

Group 3 consists of soils that are well drained or moderately well drained and are loamy or silty throughout. Permeability is moderate or moderately slow. These soils do not have free carbonates in the upper 20 inches.

Group 4 consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a silty or loamy surface layer and a clayey subsoil. Permeability is slow or very slow.

Group 4C consists of soils that are well drained, moderately well drained, or somewhat poorly drained

and have a clayey surface layer and subsoil. Permeability is slow or very slow.

Group 4F consists of soils that are well drained, moderately well drained, or somewhat poorly drained and have a substratum of dense till. Permeability is slow or very slow.

Group 5 consists of soils that are excessively drained to moderately well drained and have a moderate available water capacity. These soils are dominantly fine sandy loam or sandy loam, but some are sandy in the upper part and loamy in the lower part.

Group 6G consists of excessively drained to moderately well drained soils that are loamy in the upper part and have sand or sand and gravel at a depth of 20 to 40 inches. These soils have a low or moderate available water capacity.

Group 6D consists of excessively drained to moderately well drained, loamy soils that have bedrock at a depth of 20 to 40 inches. These

soils have a low or moderate available water capacity.

Group 7 consists of excessively drained to well drained soils that are dominantly loamy fine sand or coarser textured and are shallow to sand or to sand and gravel. These soils have a low available water capacity.

Group 8 consists of excessively drained to well drained, loamy soils that have free carbonates within 20 inches of the surface.

Group 9W consists of soils that are somewhat poorly drained, poorly drained, or very poorly drained and are moderately saline (the electrical conductivity is 8 to 16).

Group 10 consists of soils or miscellaneous land types that generally are not suitable for windbreaks. One or more characteristics, such as soil depth, texture, wetness, available water capacity, or slope, limit the planting, survival, or growth of trees and shrubs.

Cropland Management Considerations

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Cropland management considerations
13B: Olmits-----	Potential for surface-water contamination Water erosion
Vesser-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
Zook-----	Potential for ground-water contamination Potential poor tilth and compaction Water erosion Water table
23C2: Arispe-----	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Water table
24D2: Shelby-----	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
41B: Sparta-----	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Wind erosion
51: Vesser-----	Acid soil Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
51B: Vesser-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
54: Zook-----	Flooding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
65D2: Lindley-----	Potential for surface-water contamination Previously eroded Water erosion
65E: Lindley-----	Potential for surface-water contamination Slope Water erosion
65E2, 65F2: Lindley-----	Potential for surface-water contamination Previously eroded Slope Water erosion
65G: Lindley-----	Potential for surface-water contamination Slope Water erosion
74: Rubio-----	Acid soil Potential for ground-water contamination Water table
75: Givin-----	Acid soil Potential for ground-water contamination Water table
75B: Givin-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
76B: Ladoga-----	Acid soil Potential for surface-water contamination Water erosion
76C2: Ladoga-----	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
76D2: Ladoga-----	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Water erosion
80B: Clinton-----	Acid soil Potential for surface-water contamination Water erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
80C2, 80D2: Clinton-----	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Water erosion
87B: Colo-----	Potential for ground-water contamination Potential poor tilth and compaction Water table
Zook-----	Potential for ground-water contamination Potential poor tilth and compaction Water table
122: Sperry-----	Ponding Potential for ground-water contamination Potential for surface-water contamination Water table
130: Belinda-----	Acid soil Potential for ground-water contamination Restricted permeability Water table
131B: Pershing-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
131B2, 131C2: Pershing-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Water table
132B, 132C: Weller-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
132C2: Weller-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Water table
132D: Weller-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
132D2: Weller-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Water table
139: Perks-----	Excessive permeability Flooding Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
179D2: Gara-----	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
179E2: Gara-----	Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Slope Water erosion
180: Keomah-----	Acid soil Potential for ground-water contamination Water table
180B: Keomah-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
208: Klum-----	Flooding Potential for ground-water contamination Potential for surface-water contamination Wind erosion
211: Edina-----	Potential for ground-water contamination Restricted permeability Water table
220: Nodaway-----	Flooding Potential for ground-water contamination Potential for surface-water contamination

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
222C: Clarinda-----	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Restricted permeability Water erosion Water table
222C2: Clarinda-----	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Restricted permeability Water erosion Water table
223C2: Rinda-----	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Restricted permeability Water erosion Water table
260: Beckwith-----	Acid soil Potential for ground-water contamination Restricted permeability Water table
263: Okaw-----	Acid soil Ponding Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Water table
264B: Ainsworth-----	Excessive permeability Potential for ground-water contamination Potential for surface-water contamination Water erosion
273B: Olmitz-----	Potential for surface-water contamination Water erosion
279: Taintor-----	Potential for ground-water contamination Potential poor tilth and compaction Water table
280: Mahaska-----	Acid soil Potential for ground-water contamination Potential poor tilth and compaction Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
280B: Mahaska-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion Water table
281B: Otley-----	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Water erosion
281B2: Otley-----	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
281C: Otley-----	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Water erosion
281C2: Otley-----	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
293C: Chelsea-----	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
Fayette-----	Potential for surface-water contamination Water erosion
293F: Chelsea-----	Excessive permeability Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Wind erosion
Fayette-----	Potential for surface-water contamination Slope Water erosion

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
313E2: Gosport-----	Acid soil Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Previously eroded Restricted permeability Slope Water erosion Water table
313G: Gosport-----	Acid soil Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Slope Water erosion Water table
315: Nodaway-----	Flooding Potential for ground-water contamination Potential for surface-water contamination
Klum-----	Flooding Potential for ground-water contamination Potential for surface-water contamination Wind erosion
Perks-----	Excessive permeability Flooding Limited available water capacity Limited organic matter content Potential for ground-water contamination Potential for surface-water contamination Wind erosion
362: Haig-----	Acid soil Potential for ground-water contamination Restricted permeability Water table
363: Haig-----	Acid soil Potential for ground-water contamination Potential poor tilth and compaction Restricted permeability Water table
364B: Grundy-----	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water erosion Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
364B2: Grundy-----	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Water table
423D2: Bucknell-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Restricted permeability Water erosion Water table
424D2: Lindley-----	Potential for surface-water contamination Water erosion
Keswick-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
424E2: Lindley-----	Potential for surface-water contamination Previously eroded Slope Water erosion
Keswick-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Previously eroded Slope Water erosion Water table
425D: Keswick-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
425D2: Keswick-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Water table
430: Ackmore-----	Flooding Potential for ground-water contamination Potential for surface-water contamination Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
453: Tuskeego-----	Potential for ground-water contamination Restricted permeability Water table
499G: Nordness-----	Depth to rock Limited available water capacity Potential for ground-water contamination Potential for surface-water contamination Restricted permeability Slope Water erosion
520: Coppock-----	Acid soil Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
520B: Coppock-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
570C2: Nira-----	Acid soil Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion
571C2: Hedrick-----	Potential for surface-water contamination Water erosion
572C2, 572D2: Inton-----	Potential for surface-water contamination Previously eroded Water erosion
587: Chequest-----	Acid soil Flooding Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Water table
594D2: Galland-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Water table
729: Nodaway-----	Flooding Potential for ground-water contamination Potential for surface-water contamination

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
729: Coppock-----	Acid soil Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
730B: Nodaway-----	Flooding Potential for ground-water contamination Potential for surface-water contamination Water erosion
Coppock-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
Cantril-----	Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
779: Kalona-----	Potential for ground-water contamination Potential poor tilth and compaction Water table
792C2, 792D2: Armstrong-----	Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Water table
795C2, 795D2: Ashgrove-----	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Restricted permeability Water erosion Water table
822D2: Lamoni-----	Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Restricted permeability Water erosion Water table
831B: Pershing-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
831C2: Pershing-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Water table
832B: Weller-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
832C2, 832D2: Weller-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Potential poor tilth and compaction Previously eroded Water erosion Water table
876B: Ladoga-----	Acid soil Potential for surface-water contamination Water erosion
876C2: Ladoga-----	Acid soil Potential for surface-water contamination Previously eroded Water erosion
880B: Clinton-----	Acid soil Potential for surface-water contamination Water erosion
880C2, 880D2: Clinton-----	Acid soil Potential for surface-water contamination Previously eroded Water erosion
977: Richwood-----	No major limitations or hazards
993D2: Gara-----	Potential for surface-water contamination Potential poor tilth and compaction Water erosion
Armstrong-----	Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
993E2: Gara-----	Potential for surface-water contamination Potential poor tilth and compaction Slope Water erosion
Armstrong-----	Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Water table
994D2: Galland-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Previously eroded Water erosion Water table
Douds-----	Acid soil Potential for surface-water contamination Previously eroded Water erosion
994E2: Galland-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Slope Water erosion Water table
Douds-----	Acid soil Potential for surface-water contamination Slope Water erosion
1075B: Givin-----	Acid soil Potential for ground-water contamination Potential for surface-water contamination Water erosion Water table
1130: Belinda-----	Acid soil Potential for ground-water contamination Restricted permeability Water table
1260: Beckwith-----	Acid soil Potential for ground-water contamination Restricted permeability Water table
1715: Nodaway-----	Flooding Potential for ground-water contamination Potential for surface-water contamination

Cropland Management Considerations--Continued

Map symbol and soil name	Cropland management considerations
1715: Veaser-----	Acid soil Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
Ackmore-----	Flooding Potential for ground-water contamination Potential for surface-water contamination Water table
5020: Pits and dumps-----	Nonsoil material
5030: Pits-----	Nonsoil material
5040: Orthents-----	Slope Water erosion Wind erosion

Agronomic Considerations

(See text for a description of the considerations listed in this table)

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
13B----- Olmitz-Vesser-Zook	Very low	Very low plus	Fair
23C2----- Arispe	Very low	Medium	Fair
24D2----- Shelby	Very low	Low	Fair
41B----- Sparta	Very low	Low	Poor
51----- Vesser	Medium	Very low plus	Fair
51B----- Vesser	Medium	Very low plus	Good
54----- Zook	High	Medium	Fair
65D2----- Lindley	Medium	Low	Fair
65E----- Lindley	Medium	Low	Good
65E2, 65F2----- Lindley	Medium	Low	Fair
65G----- Lindley	Medium	Low	Good
74----- Rubio	High	Medium	Good
75----- Givin	High	Medium	Good
75B----- Givin	Medium	Medium	Good
76B----- Ladoga	High	Medium	Good
76C2, 76D2----- Ladoga	High	Medium	Fair
80B----- Clinton	High	Medium	Good
80C2, 80D2----- Clinton	High	Medium	Fair
87B----- Colo-Zook	Medium	Low	Fair
122----- Sperry	Medium	Medium	Fair

Agronomic Considerations--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
130----- Belinda	High	Low	Good
131B----- Pershing	High	Low	Good
131B2, 131C2----- Pershing	High	Low	Fair
132B, 132C----- Weller	High	Low	Good
132C2----- Weller	High	Low	Fair
132D----- Weller	High	Low	Good
132D2----- Weller	High	Low	Fair
139----- Perks	Very low	Very low plus	Poor
179D2, 179E2----- Gara	Medium	Low	Fair
180, 180B----- Keomah	High	Very low minus	Good
208----- Kium	Very low	Very low plus	Good
211----- Edina	Very low	Low	Fair
220----- Nodaway	High	Low	Fair
222C, 222C2----- Clarinda	Very low	Low	Fair
223C2----- Rinda	Very low	Low	Fair
260----- Beckwith	High	Very low plus	Fair
263----- Okaw	Very low	Very low plus	Good
264B----- Ainsworth	High	Medium	Good
273B----- Olmitz	Very low	Medium	Good
279----- Taintor	Very low	Low	Fair
280, 280B----- Mahaska	High	Medium	Good

Agronomic Considerations--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
281B, 281B2, 281C, 281C2----- Otley	Medium	Low	Fair
293C, 293F----- Chelsea-Payette	Very low	Very low plus	Good
313E2----- Gosport	Very low	Low	Fair
313G----- Gosport	Very low	Low	Good
315----- Nodaway-Klum-Perks	Very low	Very low plus	Good
362, 363----- Haig	Medium	Medium	Fair
364B----- Grundy	Low	Medium	Good
364B2----- Grundy	Low	Medium	Fair
423D2----- Bucknell	Very low	Very low plus	Fair
424D2, 424E2----- Lindley-Keswick	Very low	Low	Fair
425D----- Keswick	Very low	Low	Fair
425D2----- Keswick	Very low	Low	Poor
430----- Ackmore	Low	Low	Fair
453----- Tuskeego	Medium	Very low plus	Fair
499G----- Nordness	Very low	Medium	Good
520, 520B----- Coppock	High	Medium	Fair
570C2----- Nira	Medium	Medium	Fair
571C2----- Hedrick	High	Medium	Fair
572C2, 572D2----- Inton	High	Medium	Poor
587----- Chequest	High	Medium	Fair
594D2----- Galland	Very low	Very low plus	Fair

Agronomic Considerations--Continued

Map symbol and soil name	Subsoil phosphorus	Subsoil potassium	Tilth rating
729----- Nodaway-Coppock	Very low	Very low plus	Good
730B----- Nodaway-Coppock- Cantril	Very low	Very low plus	Fair
779----- Kalona	Very low	Low	Fair
792C2, 792D2----- Armstrong	Very low	Low	Fair
795C2, 795D2----- Ashgrove	Very low	Medium	Poor
822D2----- Lamoni	Very low	Medium	Fair
831B, 831C2----- Pershing	High	Low	Fair
832B----- Weller	High	Low	Good
832C2, 832D2----- Weller	High	Low	Fair
876B----- Ladoga	High	Medium	Good
876C2----- Ladoga	High	Medium	Fair
880B----- Clinton	High	Medium	Good
880C2, 880D2----- Clinton	High	Medium	Fair
977----- Richwood	High	Low	Good
993D2, 993E2----- Gara-Armstrong	Very low	Low	Fair
994D2, 994E2----- Galland-Douds	Very low	Very low plus	Fair
1075B----- Givin	High	Medium	Good
1130----- Belinda	High	Low	Good
1260----- Beckwith	High	Very low plus	Fair
1715----- Nodaway-Vesser- Ackmore	High	Medium	Good

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans	Winter wheat
		PI*	Bu	Bu	Bu	Bu
13B----- Olmitz-----	2e	60	123	62	41	49
Vesser-----	2w					
Zook-----	2w					
23C2----- Arispe	3e	50	124	62	42	50
24D2----- Shelby	3e	48	115	63	39	46
41B----- Sparta	4s	40	77	42	26	31
51----- Vesser	2w	70	130	65	44	52
51B----- Vesser	2w	65	127	64	43	51
54----- Zook	2w	70	126	69	42	50
65D2----- Lindley	4e	38	97	49	32	39
65E----- Lindley	6e	30	---	42	---	---
65E2----- Lindley	6e	28	---	40	---	---
65F2----- Lindley	7e	8	---	---	---	---
65G----- Lindley	7e	5	---	---	---	---
74----- Rubio	3w	78	138	76	46	55
75----- Givin	1	85	148	81	50	59
75B----- Givin	2e	81	145	80	49	58
76B----- Ladoga	2e	85	148	81	50	59
76C2----- Ladoga	3e	65	139	76	47	56

See footnote at end of table.

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans	Winter wheat
		<u>PI*</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>
76D2----- Ladoga	3e	55	130	72	44	52
80B----- Clinton	2e	80	139	76	47	56
80C2----- Clinton	3e	60	130	72	44	52
80D2----- Clinton	3e	50	121	67	41	48
87B----- Colo-Zook	2w	62	127	70	43	51
122----- Sperry	3w	63	124	68	42	50
130----- Belinda	3w	63	112	56	38	45
131B----- Pershing	3e	67	119	60	40	48
131B2----- Pershing	3e	63	112	56	38	45
131C2----- Pershing	3e	45	107	54	36	43
132B----- Weller	3e	60	105	53	35	42
132C----- Weller	3e	44	100	50	34	40
132C2----- Weller	3e	40	93	47	31	37
132D----- Weller	3e	32	91	46	30	36
132D2----- Weller	4e	28	84	42	28	34
139----- Perks	4s	15	50	28	17	20
179D2----- Gara	4e	43	106	53	36	42
179E2----- Gara	6e	33	---	45	---	---
180----- Keomah	2w	76	131	72	44	52
180B----- Keomah	2e	73	128	70	43	51

See footnote at end of table.

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans	Winter wheat
		<u>PI*</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>
208----- Klum	2w	55	103	57	35	41
211----- Edina	3w	55	98	49	33	39
220----- Nodaway	2w	87	153	84	51	61
222C----- Clarinda	4w	30	82	41	27	33
222C2----- Clarinda	4w	25	72	36	24	29
223C2----- Rinda	4w	22	63	32	21	25
260----- Beckwith	3w	57	100	50	34	40
263----- Okaw	3w	53	98	54	33	39
264B----- Ainsworth	2e	70	127	70	43	51
273B----- Olmitz	2e	72	137	69	46	55
279----- Taintor	2w	88	155	85	52	62
280----- Mahaska	1	95	165	91	55	66
280B----- Mahaska	2e	90	162	89	54	65
281B----- Otley	2e	90	157	86	53	63
281B2----- Otley	2e	85	153	84	51	64
281C----- Otley	3e	75	152	84	51	61
281C2----- Otley	3e	70	148	81	50	59
293C----- Chelsea----- Fayette-----	4s 3e	41	87	48	29	35
293F----- Chelsea----- Fayette-----	7s 4e	11	---	---	---	---

See footnote at end of table.

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans	Winter wheat
		<u>PI*</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>
313E2, 313G----- Gosport	7e	5	---	---	---	---
315----- Nodaway----- Klum----- Perks-----	2w 2s 4s	60	113	62	38	45
362----- Haig	2w	70	131	66	44	52
363----- Haig	2w	65	126	63	42	50
364B----- Grundy	2e	75	133	67	45	53
364B2----- Grundy	2e	70	126	63	42	50
423D2----- Bucknell	4e	13	64	32	21	26
424D2----- Lindley-Keswick	4e	15	74	37	25	30
424E2----- Lindley-Keswick	6e	5	---	29	---	---
425D----- Keswick	4e	16	65	33	22	26
425D2----- Keswick	4e	12	55	28	18	22
430----- Ackmore	2w	83	141	78	47	56
453----- Tuskeego	3w	53	105	53	35	42
499G----- Nordness	7s	5	---	---	---	---
520----- Coppock	2w	65	121	61	41	48
520B----- Coppock	2w	60	118	59	40	47
570C2----- Nira	3e	67	143	79	48	57
571C2----- Hedrick	3e	62	128	70	43	51
572C2----- Inton	3e	57	125	69	42	50

See footnote at end of table.

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans	Winter wheat
		<u>PI*</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>
572D2----- Inton	3e	47	116	64	39	46
587----- Chequest	2w	65	120	60	40	48
594D2----- Galland	4e	5	51	26	17	20
729----- Nodaway-Coppock	2w	77	134	74	45	54
730B----- Nodaway----- Coppock----- Cantril-----	2w 2w 2e	61	124	42	62	50
779----- Kalona	2w	85	152	84	51	61
792C2----- Armstrong	3e	27	73	37	24	29
792D2----- Armstrong	4e	13	64	32	21	26
795C2----- Ashgrove	4e	20	54	27	18	22
795D2----- Ashgrove	4e	8	---	23	---	---
822D2----- Lamoni	4e	15	73	37	24	29
831B----- Pershing	3e	67	119	60	40	48
831C2----- Pershing	3e	45	107	54	36	43
832B----- Weller	3e	60	105	53	35	42
832C2----- Weller	3e	40	93	47	31	37
832D2----- Weller	4e	28	84	42	28	34
876B----- Ladoga	2e	85	148	81	50	59
876C2----- Ladoga	3e	65	139	76	47	56
880B----- Clinton	2e	80	139	76	47	56

See footnote at end of table.

Land Capability, Corn Suitability Rating, and Yields per Acre of Crops--Continued

Map symbol and soil name	Land capability	Corn suitability rating	Corn	Oats	Soybeans	Winter wheat
		<u>PI*</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>	<u>Bu</u>
880C2----- Clinton	3e	50	130	72	44	52
880D2----- Clinton	3e	50	121	67	41	48
977----- Richwood	1	95	162	89	54	65
993D2----- Gara-Armstrong	4e	20	83	42	28	33
993E2----- Gara-Armstrong	6e	10	---	33	---	---
994D2----- Galland-Douds	4e	12	54	27	18	---
994E2----- Galland-Douds	6e	5	---	21	---	---
1075B----- Givin	2e	81	145	80	49	58
1130----- Belinda	3w	53	112	56	38	45
1260----- Beckwith	3w	57	100	50	34	40
1715----- Nodaway-Vesser- Ackmore	2w	80	140	77	47	56
5020----- Pits and Dumps	8s	---	---	---	---	---
5030----- Pits	8s	---	---	---	---	---
5040. Orthents						

* Productivity index; on a scale of 5 to 100.

Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Map symbol and soil name	Land capability	Brome-grass- alfalfa hay	Brome-grass- alfalfa	Kentucky bluegrass	Smooth brome-grass
		<u>Tons</u>	<u>AUM*</u>	<u>AUM*</u>	<u>AUM*</u>
13B----- Olmits-----	2e	3.7	9.6	3.0	5.0
Vesser-----	2w				
Zook-----	2w				
23C2----- Arispe	3e	5.0	8.3	3.1	5.1
24D2----- Shelby	3e	4.8	8.1	2.8	4.7
41B----- Sparta	4s	3.2	---	1.9	3.2
51----- Vesser	2w	3.9	6.5	3.2	5.3
51B----- Vesser	2w	3.8	6.4	3.1	5.2
54----- Zook	2w	3.8	---	3.1	5.2
65D2----- Lindley	4e	4.1	---	2.4	4.0
65E----- Lindley	6e	3.5	---	2.1	3.4
65E2----- Lindley	6e	3.4	---	2.0	3.3
65P2----- Lindley	7e	---	---	1.7	2.9
65G----- Lindley	7e	---	---	1.7	2.8
74----- Rubio	3w	4.1	6.9	3.4	5.7
75----- Givin	1	5.9	9.9	3.6	6.1
75B----- Givin	2e	5.8	9.7	3.6	5.9
76B----- Ladoga	2e	6.2	10.4	3.6	6.1
76C2----- Ladoga	3e	5.8	9.8	3.4	5.7

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass- alfalfa hay	Bromegrass- alfalfa	Kentucky bluegrass	Smooth bromegrass
		<u>Tons</u>	<u>AUM*</u>	<u>AUM*</u>	<u>AUM*</u>
76D2----- Ladoga	3e	5.5	9.1	3.2	5.3
80B----- Clinton	2e	5.8	9.8	3.4	5.7
80C2----- Clinton	3e	5.5	9.1	3.2	5.3
80D2----- Clinton	3e	5.1	8.5	3.0	5.0
87B----- Colo-Zook	2w	3.8	6.8	3.1	5.2
122----- Sperry	3w	3.7	6.2	3.1	5.1
130----- Belinda	3w	3.4	5.6	2.8	4.6
131B----- Pershing	3e	4.8	8.0	2.9	4.9
131B2----- Pershing	3e	4.5	7.5	2.8	4.6
131C2----- Pershing	3e	4.3	7.2	2.6	4.4
132B----- Weller	3e	4.4	7.4	2.6	4.3
132C----- Weller	3e	4.2	7.0	2.5	4.1
132C2----- Weller	3e	3.9	6.5	2.3	3.8
132D----- Weller	3e	3.8	6.4	2.2	3.7
132D2----- Weller	4e	3.5	5.9	2.1	3.4
139----- Perks	4e	2.1	3.3	1.2	2.1
179D2----- Gara	4e	4.5	7.4	2.6	4.3
179E2----- Gara	6e	3.7	6.2	2.2	3.6
180----- Keomah	2w	5.2	8.8	3.2	5.4
180B----- Keomah	2e	5.1	8.6	3.1	5.2

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass- alfalfa hay	Bromegrass- alfalfa	Kentucky bluegrass	Smooth bromegrass
		<u>Tons</u>	<u>AUM*</u>	<u>AUM*</u>	<u>AUM*</u>
208----- Klum	2w	4.3	7.2	2.5	4.2
211----- Edina	3w	3.2	---	2.6	4.6
220----- Nodaway	2w	6.4	10.7	3.8	6.3
222C----- Clarinda	4w	2.5	4.1	2.0	3.4
222C2----- Clarinda	4w	2.2	3.6	1.8	3.3
223C2----- Rinda	4w	1.9	3.2	1.5	2.6
260----- Beckwith	3w	3.0	5.0	2.5	4.1
263----- Okaw	3w	2.9	---	2.4	4.0
264B----- Ainsworth	2e	5.3	8.9	3.1	5.2
273B----- Olmitz	2e	5.8	9.6	3.4	5.6
279----- Taintor	2w	4.7	7.8	3.8	6.4
280----- Mahaska	1	6.6	11.0	4.1	6.8
280B----- Mahaska	2e	6.5	10.8	4.0	6.6
281B----- Otley	2e	6.6	11.0	3.9	6.4
281B2----- Otley	2e	6.4	10.7	3.8	6.3
281C----- Otley	3e	6.4	10.7	3.7	6.2
281C2----- Otley	3e	6.2	10.4	3.6	6.1
293C----- Chelsea-----	4s	3.7	4.4	2.1	3.6
Fayette-----	3e				
293P----- Chelsea-----	7s	---	---	1.3	2.1
Fayette-----	4e				

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass- alfalfa hay	Bromegrass- alfalfa	Kentucky bluegrass	Smooth bromegrass
		<u>Tons</u>	<u>AUM*</u>	<u>AUM*</u>	<u>AUM*</u>
313E2----- Gosport	7e	---	---	0.8	1.4
313G----- Gosport	7e	---	---	0.7	1.1
315----- Nodaway----- Klum----- Perks-----	2w 2s 4s	4.7	10.7	2.8	4.6
362----- Haig	2w	3.9	6.6	3.2	5.4
363----- Haig	2w	3.8	6.6	3.1	5.2
364B----- Grundy	2e	5.3	---	3.3	5.5
364B2----- Grundy	2e	5.0	---	3.1	5.2
423D2----- Bucknell	4e	2.6	4.3	1.6	2.6
424D2----- Lindley-Keswick	4e	3.1	---	1.8	3.0
424E2----- Lindley-Keswick	6e	2.4	---	1.4	2.3
425D----- Keswick	4e	2.7	4.6	1.6	2.7
425D2----- Keswick	4e	2.3	3.9	1.4	2.3
430----- Ackmore	2w	4.2	7.1	3.5	5.8
453----- Tuskeego	3w	3.2	5.3	2.6	4.3
499G----- Nordness	7s	---	---	0.5	0.8
520----- Coppock	2w	3.6	6.1	3.0	5.0
520B----- Coppock	2w	3.5	5.9	2.9	4.8
570C2----- Nira	3e	6.0	10.0	3.5	5.9
571C2----- Hedrick	3e	5.4	9.0	3.1	5.2

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass- alfalfa hay	Bromegrass- alfalfa	Kentucky bluegrass	Smooth bromegrass
		<u>Tons</u>	<u>AUM*</u>	<u>AUM*</u>	<u>AUM*</u>
572C2----- Inton	3e	5.3	8.8	3.1	5.1
572D2----- Inton	3e	4.9	8.1	2.9	4.8
587----- Chequest	2w	3.6	6.0	3.0	4.9
594D2----- Galland	4e	2.0	3.0	1.3	2.1
729----- Nodaway-Coppock	2w	5.6	10.7	3.3	5.5
730B----- Nodaway----- Coppock----- Cantril-----	2w 2w 2e	6.4	5.0	3.1	5.1
779----- Kalona	2w	4.6	7.6	3.7	6.2
792C2----- Armstrong	3e	2.9	4.9	1.8	3.0
792D2----- Armstrong	4e	2.6	4.3	1.6	2.6
795C2----- Ashgrove	4e	1.6	2.7	1.3	2.2
795D2----- Ashgrove	4e	1.4	2.3	1.1	1.8
822D2----- Lamon1	4e	2.9	4.9	1.8	3.0
831B----- Pershing	3e	4.8	8.0	2.9	4.9
831C2----- Pershing	3e	4.3	7.2	2.6	4.4
832B----- Weller	3e	4.4	7.4	2.6	4.3
832C2----- Weller	3e	3.9	6.5	2.3	3.8
832D2----- Weller	4e	3.5	5.9	2.1	3.4
876B----- Ladoga	2e	6.2	10.4	3.6	6.1
876C2----- Ladoga	3e	5.8	9.8	3.4	5.7

See footnote at end of table.

Land Capability and Yields per Acre of Crops and Pasture--Continued

Map symbol and soil name	Land capability	Bromegrass- alfalfa hay	Bromegrass- alfalfa	Kentucky bluegrass	Smooth bromegrass
		<u>Tons</u>	<u>AUM*</u>	<u>AUM*</u>	<u>AUM*</u>
880B----- Clinton	2a	5.8	9.8	3.4	5.7
880C2----- Clinton	3a	5.5	9.1	3.2	5.3
880D2----- Clinton	3a	5.1	8.5	3.0	5.0
977----- Richwood	1	6.8	---	4.0	6.6
993D2----- Gara-Armstrong	4c	3.3	7.4	2.0	3.4
993E2----- Gara-Armstrong	6c	2.6	6.2	1.6	2.7
994D2----- Galland-Douds	4c	2.3	3.0	1.4	2.4
994E2----- Galland-Douds	6c	1.0	1.6	1.0	1.7
1075B----- Givin	2e	5.8	9.7	3.6	5.9
1130----- Belinda	3w	3.4	5.6	2.8	4.6
1260----- Beckwith	3w	3.0	5.0	2.5	4.1
1715----- Nodaway-Vesser- Ackmore	2w	5.6	10.7	3.4	5.7
5020----- Pits and Dumps	8a	---	---	---	---
5030----- Pits	8a	---	---	---	---
5040. Orthents					

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Prime Farmland

Map symbol	Soil name
13B	Olmitz-Vesser-Zook complex, 0 to 5 percent slopes (where drained)
51	Vesser silt loam, 0 to 2 percent slopes (where drained)
51B	Vesser silt loam, 2 to 5 percent slopes (where drained)
54	Zook silty clay loam, 0 to 2 percent slopes (where drained)
74	Rubio silt loam, 0 to 2 percent slopes (where drained)
75	Givin silt loam, 0 to 2 percent slopes
75B	Givin silt loam, 2 to 5 percent slopes
76B	Ladoga silt loam, 2 to 5 percent slopes
80B	Clinton silt loam, 2 to 5 percent slopes
87B	Colo-Zook complex, 0 to 5 percent slopes (where drained)
122	Sperry silt loam, 0 to 1 percent slopes (where drained)
130	Belinda silt loam, 0 to 2 percent slopes (where drained)
131B	Pershing silt loam, 2 to 5 percent slopes
132B	Weller silt loam, 2 to 5 percent slopes
180	Keomah silt loam, 0 to 2 percent slopes
180B	Keomah silt loam, 2 to 5 percent slopes
211	Edina silt loam, depressional, 0 to 1 percent slopes (where drained)
220	Nodaway silt loam, 0 to 2 percent slopes
264B	Ainsworth silt loam, 2 to 5 percent slopes
273B	Olmitz loam, 2 to 5 percent slopes
279	Taintor silty clay loam, 0 to 2 percent slopes (where drained)
280	Mahaska silty clay loam, 0 to 2 percent slopes
280B	Mahaska silty clay loam, 2 to 5 percent slopes
281B	Otley silty clay loam, 2 to 5 percent slopes
362	Haig silt loam, 0 to 2 percent slopes (where drained)
363	Haig silty clay loam, 0 to 1 percent slopes (where drained)
364B	Grundy silty clay loam, 2 to 5 percent slopes
430	Ackmore silt loam, 0 to 2 percent slopes (where drained)
453	Tuskeego silt loam, 0 to 2 percent slopes (where drained)
520	Coppock silt loam, 0 to 2 percent slopes (where drained)
520B	Coppock silt loam, 2 to 5 percent slopes (where drained)
587	Chequest silty clay loam, 0 to 2 percent slopes (where drained)
729	Nodaway-Coppock complex, 0 to 2 percent slopes (where drained)
730B	Nodaway-Coppock-Cantril complex, 2 to 5 percent slopes (where drained)
779	Kalona silty clay loam, 0 to 1 percent slopes (where drained)
831B	Pershing silt loam, bench, 2 to 5 percent slopes
832B	Weller silt loam, bench, 2 to 5 percent slopes
876B	Ladoga silt loam, bench, 2 to 5 percent slopes
880B	Clinton silt loam, bench, 2 to 5 percent slopes
977	Richwood silt loam, 0 to 2 percent slopes
1075B	Givin silt loam, bench, 2 to 5 percent slopes
1130	Belinda silt loam, bench, 0 to 2 percent slopes (where drained)
1715	Nodaway-Vesser-Ackmore complex, 0 to 2 percent slopes (where drained)

Windbreaks and Environmental Plantings

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
13B: Olmitz-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Vesser-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
Zook-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
23C2: Arispe-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
24D2: Shelby-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
41B: Sparta-----	Siberian peashrub	Washington hawthorn, autumn- olive, eastern redcedar, Amur honeysuckle, radiant crabapple, lilac.	Jack pine, Austrian pine, red pine.	Eastern white pine	---
51, 51B: Vesser-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
54: Zook-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
65D2, 65E, 65E2, 65P2, 65Q: Lindley-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
74: Rubio-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
75, 75B: Givin-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
76B, 76C2, 76D2: Ladoga-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
80B, 80C2, 80D2: Clinton-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
87B: Colo-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
Zook-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
122: Sperry-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
130: Belinda-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
131B, 131B2, 131C2: Pershing-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
132B, 132C, 132C2, 132D, 132D2: Weller-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
139: Perks-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
179D2, 179E2: Gara-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
180, 180B: Keomah-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
208: Klum-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
211: Edina-----	Redosier dogwood	Silky dogwood, holly, American cranberrybush.	Washington hawthorn, green ash, Austrian pine, northern whitecedar.	Red maple, eastern white pine.	Pin oak.
220: Nodaway-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
222C, 222C2: Clarinda-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange.	Austrian pine, eastern white pine, pin oak.	---
223C2: Rinda-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
260: Beckwith-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
263: Okaw-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
264B: Ainsworth-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
273B: Olmitz-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
279: Taintor-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
280, 280B: Mahaska-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, eastern white pine.	Norway spruce-----	Pin oak.
281B, 281B2, 281C, 281C2: Otley-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
293C, 293F: Chelsea-----	Siberian peashrub	Washington hawthorn, autumn- olive, eastern redcedar, Amur honeysuckle, radiant crabapple, lilac.	Jack pine, Austrian pine, red pine.	Eastern white pine	---
Fayette-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
313E2, 313G: Gosport-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
315: Nodaway-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce----	Eastern white pine, pin oak.
Klum-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce----	Eastern white pine, pin oak.
Perks-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce----	Eastern white pine, pin oak.
362, 363: Haig-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
364B, 364B2: Grundy-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
423D2: Bucknell-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
424D2, 424E2: Lindley-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Keswick-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
425D, 425D2: Keswick-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
430: Ackmore-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
453: Tuskeego-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
520, 520B: Coppock-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
570C2: Nira-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
571C2: Hedrick-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
572C2, 572D2: Inton-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Silver maple, eastern white pine, pin oak.
587: Chequest-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
594D2: Galland-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
729: Nodaway-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
Coppock-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
730B: Nodaway-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
730B: Cantril-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
779: Kalona-----	---	Silky dogwood, Amur privet, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
792C2, 792D2: Armstrong-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
795C2, 795D2: Ashgrove-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
822D2: Lamoni-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
831B, 831C2: Pershing-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
832B, 832C2, 832D2: Weller-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
876B, 876C2: Ladoga-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
880B, 880C2, 880D2: Clinton-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
977: Richwood-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
993D2, 993E2: Gara-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Armstrong-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---
994D2, 994E2: Galland-----	---	Washington hawthorn, eastern redcedar, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Osage-orange, Austrian pine.	Eastern white pine, pin oak.	---

Windbreaks and Environmental Plantings--Continued

Map symbol and soil name	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
994D2, 994E2: Douds-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, blue spruce, northern whitecedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
1075B: Givin-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
1130: Belinda-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
1260: Beckwith-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
1715: Nodaway-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.
Vesser-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Norway spruce, Austrian pine, blue spruce, northern whitecedar.	Eastern white pine	Pin oak.
Ackmore-----	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	White fir, Washington hawthorn, Austrian pine, blue spruce, northern whitecedar.	Norway spruce-----	Eastern white pine, pin oak.

Windbreak Suitability Groups

(Suitable shrubs and trees with their mature heights are listed in the "Windbreaks and Environmental Plantings" table. Absence of an entry indicates that a windbreak suitability group is not assigned)

Map symbol and soil name	Windbreak suitability group
13B:	
Olmitz-----	3
Vessser-----	2
Zook-----	2
23C2-----	3
Arispe	
24D2-----	1
Shelby	
41B-----	7
Sparta	
51, 51B-----	2
Vessser	
54-----	2
Zook	
65D2, 65E, 65E2, 65F2, 65G-----	3
Lindley	
74-----	2
Rubio	
75, 75B-----	1
Givin	
76B, 76C2, 76D2-----	3
Ladoga	
80B, 80C2, 80D2-----	3
Clinton	
87B-----	2
Colo-Zook	
122-----	2
Sperry	
130-----	2
Belinda	
131B, 131B2, 131C2-----	4
Pershing	
132B, 132C, 132C2, 132D, 132D2-----	4
Weller	

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
139----- Perks	1
179D2, 179E2-- Gara	3
180, 180B----- Keomah	1
208----- Klum	1
211----- Edina	2
220----- Nodaway	1
222C, 222C2--- Clarinda	4
223C2----- Rinda	4
260----- Beckwith	2
263----- Okaw	2
264B----- Ainsworth	3
273B----- Olmitz	3
279----- Taintor	2
280, 280B----- Mahaska	1
281B, 281B2, 281C, 281C2-- Otley	3
293C, 293F: Chelsea-----	7
Payette-----	3
313E2, 313G--- Gosport	4
315----- Klum-Nodaway- Perks	1
362, 363----- Haig	2
364B, 364B2--- Grundy	4

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
423D2----- Bucknell	4
424D2, 424E2: Keswick-----	4
Lindley-----	3
425D, 425D2--- Keswick	4
430----- Ackmore	1
453----- Tuskeego	2
499G----- Nordness	10
520, 520B----- Coppock	1
570C2----- Nira	3
571C2----- Hedrick	3
572C2, 572D2--- Inton	3
587----- Chequest	2
594D2----- Galland	4
729----- Coppock- Nodaway	1
730B----- Cantril- Coppock- Nodaway	1
779----- Kalona	2
792C2, 792D2--- Armstrong	4
795C2, 795D2--- Ashgrove	4
822D2----- Lamoni	4
831B, 831C2--- Pershing	4

Windbreak Suitability Groups--Continued

Map symbol and soil name	Windbreak suitability group
832B, 832C2, 832D2----- Weller	4
876B, 876C2--- Ladoga	3
880B, 880C2, 880D2----- Clinton	3
977----- Richwood	3
993D2, 993E2: Armstrong----	4
Gara-----	3
994D2, 994E2: Douds-----	3
Galland-----	4
1075B----- Givin	1
1130----- Belinda	2
1260----- Beckwith	2
1715: Ackmore-----	1
Nodaway-----	1
Vesser-----	2

Forest Land

The original land survey of Iowa, made from 1832 to 1859, indicated that 143,250 acres in the survey area, or about 51 percent of the total acreage, was wooded when the first settlers arrived. The early settlers felled a large percentage of this timber when they cleared the land for farming (Andreas, 1875).

According to a 1954 USDA Forest Service survey, woodland in Jefferson County had declined to about 37,000 acres, or 13 percent of the total acreage of the county (Davidson, 1961). From 1954 to 1974, the acreage used as woodland decreased to about 17,000 acres, or only 6 percent of the total acreage. This decrease of almost 50 percent of the standing timber in the county over a 20-year period is attributed to the conversion of moderately steep, highly erodible woodland sites to cropland (Ostron, 1974).

According to the 1991 USDA Forest Service woodland survey, the trend toward a decreasing forest resource ended between 1974 and 1990. The report showed that Jefferson County's woodland base increased to 22,600 acres, or 8 percent of the total acreage. Most of this new timberland came from land that was formerly classified as pasture (improved pasture, wooded pasture, and improved pasture with trees) but is no longer grazed (Branel and Walkowiak, 1991).

The principal upland tree species in Jefferson County are white oak, northern red oak, black oak, shagbark hickory, and bitternut hickory. Typical bottom-land species are eastern cottonwood, silver maple, green ash, hackberry, basswood, and black walnut. Black cherry and river birch are common, if not plentiful. American elm and red elm are abundant; however, these trees are generally small because of the effect of Dutch elm disease.

The majority of the upland timber is in areas of Lindley, Weller, Keswick, Gara, and Clinton soils. Most of the bottom-land timber is in areas of Nodaway and Coppock soils.

Woodland owners tend to cut only the best individual trees or species from their timber stands. This practice, known as high-grading, results in a residual stand of poor quality trees. Scientific forest management of woodland stands (silviculture) can

result in the production of an increased volume of valuable forest products. A well managed stand can maximize economic return, reduce soil loss, improve water quality, and enhance recreational opportunities.

Woodland management is important for maximizing the potential of a stand. The first step in sound forest management is protecting the timber from grazing and fire. Grazing by livestock results in sparse, poor quality woodlands. The hooves of livestock damage the base of larger trees, thereby allowing access by decay organisms. The decay results in a decrease in value of the standing trees. Livestock hooves also trample young seedlings and cause surface compaction. Surface compaction reduces the rate of water infiltration, deprives trees of the moisture they need for rapid growth, and increases the runoff rate. An increased runoff rate results in erosion and siltation (Wray and Farris, 1986).

In a stand of trees, the trees that have the greatest potential for high quality production should be allowed to grow. Undesirable trees and vines that compete for moisture, nutrients, and light should be eradicated. Before the trees are harvested, the growing space of the trees to be removed should be occupied with young, desirable trees. The volume harvested should balance with the growth rate of the residual stand.

The suitability of soil types for growing individual tree species varies greatly. Green ash, for example, can grow in poorly drained soils and in droughty soils on south-facing slopes. Most species cannot tolerate such a wide range of conditions. Black walnut grows best in deep, permeable soils on moist sites.

Soils on north- and east-facing slopes are better suited to trees than soils on south- and west-facing slopes. Generally, deep, well drained or moderately well drained soils are well suited to trees (Countryman and others, 1985). If the subsoil is slowly permeable, root development and growth are restricted. Severely eroded areas are suitable for eastern redcedar, Scotch pine, jack pine, black locust, and Osage-orange.

Further information about woodland management, tree planting, and insect and disease control can be obtained from the Jefferson County Soil Conservation

District, from the district forester of the Iowa Department of Natural Resources, or from private consulting foresters.

The information in the table "Woodland Management and Productivity" at the end of this section can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *N*, snowpack. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: *R*, *X*, *W*, *T*, *D*, *C*, *S*, *F*, and *N*.

In the table, *slight*, *moderate*, and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, and fire lanes and in log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of

equipment and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

Plant competition ratings indicate the degree to which undesirable species are expected to invade and grow when openings are made in the tree canopy. The main factors that affect plant competition are depth to the water table and the available water capacity. A rating of *slight* indicates that competition from undesirable plants is not likely to prevent natural regeneration or suppress the more desirable species. Planted seedlings can become established without undue competition. A rating of *moderate* indicates

that competition may delay the establishment of desirable species. Competition may hamper stand development, but it will not prevent the eventual development of fully stocked stands. A rating of *severe* indicates that competition can be expected to prevent regeneration unless precautionary measures are applied.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *productivity class*. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked,

even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *productivity class*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic meters per hectare per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

Trees to plant are those that are suitable for commercial wood production.

Woodland Management and Productivity

(Only the soils suitable for production of commercial trees are listed)

Map symbol and soil name	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Produc- tivity class*	
41B: Sparta-----	4S	Slight	Slight	Severe	Slight	Slight	Northern red oak----	70	4	Jack pine, red pine, eastern white pine.
							Jack pine-----	---	---	
							Red pine-----	---	---	
							Eastern white pine--	---	---	
65D2: Lindley-----	3A	Slight	Slight	Slight	Slight	Severe	White oak-----	56	3	White oak, northern red oak, black oak.
							Northern red oak----	61	3	
							Black oak-----	63	3	
65E, 65E2, 65F2, 65G: Lindley-----	3R	Moderate	Moderate	Slight	Slight	Severe	White oak-----	56	3	White oak, northern red oak, black oak.
							Northern red oak----	61	3	
							Black oak-----	63	3	
74: Rubio-----	2W	Slight	Severe	Moderate	Moderate	Severe	White oak-----	45	2	Silver maple, green ash, American sycamore, eastern cottonwood, laurel willow, northern whitecedar.
75, 75B: Givin-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak-----	65	3	Sugar maple, black walnut, red pine, eastern white pine, white oak, northern red oak.
							Northern red oak----	---	---	
76B, 76C2, 76D2: Ladoga-----	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----	75	4	Sugar maple, black walnut, European larch, red pine, eastern white pine, white oak, northern red oak.
							Northern red oak----	75	4	

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Produc- tivity class*	
80B, 80C2, 80D2: Clinton-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak----- Northern red oak----	65 65	3 3	Black walnut, European larch, red pine, eastern white pine, white oak, northern red oak.
130: Belinda-----	2W	Slight	Severe	Moderate	Moderate	Severe	White oak-----	45	2	Silver maple, green ash, American sycamore, eastern cottonwood, golden willow, northern whitecedar.
131B, 131B2, 131C2: Pershing-----	3C	Slight	Slight	Severe	Severe	Slight	White oak-----	55	3	Red pine, eastern white pine, white oak.
132B, 132C, 132C2, 132D, 132D2: Weller-----	3C	Slight	Slight	Severe	Severe	Slight	White oak-----	55	3	Sugar maple, black walnut, red pine, eastern white pine.
139: Perka-----	3S	Slight	Slight	Moderate	Slight	Slight	White oak-----	55	3	Eastern white pine.
179D2: Gara-----	3A	Slight	Slight	Slight	Slight	Slight	White oak----- Northern red oak----	55 55	3 3	Red pine, eastern white pine, white oak, northern red oak.
179E2: Gara-----	3R	Moderate	Moderate	Slight	Slight	Slight	White oak----- Northern red oak----	55 55	3 3	Red pine, eastern white pine, white oak, northern red oak.

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Produc- tivity class*	
180, 180B: Keomah-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak----- Northern red oak----	65 70	3 4	Sugar maple, black walnut, red pine, eastern white pine, white oak, northern red oak.
220: Nodaway-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak-----	65	3	Sugar maple, black walnut, European larch, red pine, eastern white pine.
223C2: Rinda-----	2W	Slight	Severe	Moderate	Moderate	Severe	White oak----- Northern red oak----	45 45	2 2	Silver maple, hackberry, green ash, eastern redcedar, Norway spruce, white spruce, American sycamore.
260: Beckwith-----	2W	Slight	Severe	Moderate	Moderate	Severe	White oak-----	45	2	Silver maple, green ash, American sycamore, eastern cottonwood.
263: Okaw-----	4W	Slight	Severe	Severe	Severe	Severe	Pin oak----- Blackjack oak----- Black oak----- White oak-----	70 60 55 ---	4 3 3 ---	Red maple, green ash, water tupelo, swamp white oak, pin oak, baldcypress.
264B: Ainsworth-----	6A	Slight	Slight	Slight	Slight	Moderate	Green ash----- Silver maple-----	80 ---	6 ---	Sugar maple, European larch, Norway spruce, white spruce, red pine, eastern white pine, white oak, northern red oak.

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Produc- tivity class*	
293C: Chelsea-----	3S	Slight	Slight	Moderate	Slight	Slight	White oak-----	55	3	Eastern redcedar, European larch, jack pine, red pine, eastern white pine, Scotch pine.
Fayette-----	4A	Slight	Slight	Slight	Slight	Moderate	White oak----- Black walnut----- Yellow-poplar----- Northern red oak----	80 --- 90 80	4 --- 6 4	Green ash, yellow-poplar, eastern white pine, northern red oak.
293F: Chelsea-----	3R	Moderate	Severe	Moderate	Slight	Slight	White oak-----	55	3	Eastern redcedar, European larch, jack pine, red pine, eastern white pine, Scotch pine.
Fayette-----	4R	Moderate	Moderate	Slight	Slight	Moderate	White oak----- Black walnut----- Yellow-poplar----- Northern red oak----	80 --- 90 80	4 --- 6 4	Green ash, yellow-poplar, eastern white pine, northern red oak.
313E2: Gosport-----	2C	Slight	Slight	Severe	Severe	Slight	White oak-----	45	2	Norway spruce, white spruce, red pine, eastern white pine, Scotch pine, cottonwood.
313G: Gosport-----	2R	Moderate	Moderate	Severe	Severe	Slight	White oak-----	45	2	Norway spruce, white spruce, red pine, eastern white pine, Scotch pine, cottonwood.
315: Nodaway-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak-----	65	3	Sugar maple, black walnut, European larch, red pine, eastern white pine.
Klum.										

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Produc- tivity class*	
315: Perks-----	3S	Slight	Slight	Moderate	Slight	Slight	White oak-----	55	3	Eastern white pine.
423D2: Bucknell-----	2C	Slight	Slight	Slight	Moderate	Slight	White oak----- Northern red oak----	50 50	2 2	Silver maple, hackberry, green ash, eastern redcedar, American sycamore.
424D2: Lindley-----	3A	Slight	Slight	Slight	Slight	Severe	White oak----- Northern red oak---- Black oak-----	56 61 63	3 3 3	White oak, northern red oak, black oak.
Keswick-----	3C	Slight	Slight	Moderate	Severe	Slight	White oak----- Northern red oak----	55 55	3 3	Sugar maple, red pine, eastern white pine.
424E2: Lindley-----	3R	Moderate	Moderate	Slight	Slight	Severe	White oak----- Northern red oak---- Black oak-----	56 61 63	3 3 3	White oak, northern red oak, black oak.
Keswick-----	3R	Moderate	Moderate	Moderate	Severe	Slight	White oak----- Northern red oak----	55 55	3 3	Sugar maple, red pine, eastern white pine.
425D, 425D2: Keswick-----	3C	Slight	Slight	Moderate	Severe	Slight	White oak----- Northern red oak----	55 55	3 3	Sugar maple, red pine, eastern white pine.
430: Ackmore-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak-----	65	3	Sugar maple, black walnut, red pine, eastern white pine, cottonwood.
453: Tuskeego-----	2W	Slight	Severe	Moderate	Moderate	Severe	Silver maple----- Eastern cottonwood--	80 90	2 7	Silver maple, green ash, American sycamore, eastern cottonwood, laurel willow, northern whitecedar.

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Produc- tivity class*	
499G: Nordness-----	2R	Moderate	Moderate	Severe	Severe	Slight	White oak----- Northern red oak----	45 45	2 2	---
520, 520B: Coppock-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak----- Northern red oak----	65 65	3 3	Sugar maple, red pine, eastern white pine.
571C2: Redrick-----	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----	75	4	Sugar maple, eastern redcedar, Norway spruce, white spruce, red pine, eastern white pine, Scotch pine.
572C2, 572D2: Inton-----	3A	Slight	Slight	Slight	Slight	Slight	White oak----- Northern red oak----	65 65	3 3	Sugar maple, black walnut, red pine, eastern white pine.
587: Chequest-----	2W	Slight	Severe	Moderate	Moderate	Severe	Silver maple----- Eastern cottonwood--	80 90	2 7	Silver maple, green ash, American sycamore, eastern cottonwood, laurel willow, northern whitecedar.
594D2: Galland-----	3C	Slight	Slight	Severe	Severe	Moderate	White oak----- Northern red oak----	65 70	3 4	Sugar maple, black walnut, red pine, eastern white pine.
729: Nodaway-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak-----	65	3	Sugar maple, black walnut, European larch, red pine, eastern white pine.
Coppock-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak----- Northern red oak----	65 65	3 3	Sugar maple, red pine, eastern white pine.

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Produc- tivity class*	
730B: Nodaway-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak-----	65	3	Sugar maple, black walnut, European larch, red pine, eastern white pine.
Coppock. Cantril-----	4A	Slight	Slight	Slight	Slight	Moderate	White oak-----	75	4	Sugar maple, white spruce, red pine, eastern white pine.
792C2, 792D2: Armstrong-----	3C	Slight	Slight	Moderate	Severe	Slight	White oak----- Northern red oak----	55 55	3 3	Sugar maple, European larch, red pine, eastern white pine.
795C2, 795D2: Ashgrove-----	2W	Slight	Severe	Moderate	Moderate	Severe	White oak----- Northern red oak----	45 45	2 2	Silver maple, hackberry, green ash, American sycamore.
831B, 831C2: Pershing-----	3C	Slight	Slight	Severe	Severe	Slight	White oak-----	55	3	Red pine, eastern white pine, white oak.
832B, 832C2, 832D2: Weller-----	3C	Slight	Slight	Severe	Severe	Slight	White oak-----	55	3	Sugar maple, black walnut, red pine, eastern white pine.
876B, 876C2: Ladoga-----	4A	Slight	Slight	Slight	Slight	Moderate	White oak----- Northern red oak----	75 75	4 4	Sugar maple, black walnut, European larch, red pine, eastern white pine, white oak, northern red oak.

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Produc- tivity class*	
880B, 880C2, 880D2; Clinton-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak----- Northern red oak----	65 65	3 3	Black walnut, European larch, red pine, eastern white pine, white oak, northern red oak.
993D2; Gara-----	3A	Slight	Slight	Slight	Slight	Slight	White oak----- Northern red oak----	55 55	3 3	Red pine, eastern white pine, white oak, northern red oak.
Armstrong-----	3C	Slight	Slight	Moderate	Severe	Slight	White oak----- Northern red oak----	55 55	3 3	Sugar maple, European larch, red pine, eastern white pine.
993E2; Gara-----	3R	Moderate	Moderate	Slight	Slight	Slight	White oak----- Northern red oak----	55 55	3 3	Red pine, eastern white pine, white oak, northern red oak.
Armstrong-----	3R	Moderate	Moderate	Moderate	Severe	Slight	White oak----- Northern red oak----	55 55	3 3	Sugar maple, European larch, red pine, eastern white pine.
994D2; Galland-----	3C	Slight	Slight	Severe	Severe	Moderate	White oak----- Northern red oak----	65 70	3 4	Sugar maple, black walnut, red pine, eastern white pine.
Douds-----	3A	Slight	Slight	Slight	Slight	Slight	White oak----- Northern red oak----	55 55	3 3	Sugar maple, European larch, Norway spruce, white spruce, red pine, eastern white pine, Scotch pine.
994E2; Galland-----	3R	Moderate	Moderate	Severe	Severe	Moderate	White oak----- Northern red oak----	65 70	3 4	Sugar maple, black walnut, red pine, eastern white pine.

See footnote at end of table.

Woodland Management and Productivity--Continued

Map symbol and soil name	Ordi- nation symbol	Management concerns					Potential productivity			Trees to plant
		Erosion hazard	Equip- ment limita- tion	Seedling mortal- ity	Wind- throw hazard	Plant competi- tion	Common trees	Site index	Produc- tivity class*	
994E2: Douds-----	3R	Moderate	Moderate	Slight	Slight	Slight	White oak----- Northern red oak----	55 55	3 3	Sugar maple, European larch, Norway spruce, white spruce, red pine, eastern white pine, Scotch pine.
1075B: Givin-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak----- Northern red oak----	65 ---	3 ---	Sugar maple, black walnut, red pine, eastern white pine, white oak, northern red oak.
1130: Belinda-----	2W	Slight	Severe	Moderate	Moderate	Severe	White oak-----	45	2	Silver maple, green ash, American sycamore, eastern cottonwood, golden willow, northern whitecedar.
1260: Beckwith-----	2W	Slight	Severe	Moderate	Moderate	Severe	White oak-----	45	2	Silver maple, green ash, American sycamore, eastern cottonwood.
1715: Nodaway-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak-----	65	3	Sugar maple, black walnut, European larch, red pine, eastern white pine.
Vesser, Ackmore-----	3A	Slight	Slight	Slight	Slight	Moderate	White oak-----	65	3	Sugar maple, black walnut, red pine, eastern white pine, cottonwood.

* Productivity class is the yield in cubic meters per hectare per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

Recreation

The soils of the survey area are rated in the table "Recreational Development" according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites, and either access to public sewer lines or the capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degrees, for recreational uses by the duration of flooding and the season when it occurs. Onsite assessment of the height, duration, intensity, and frequency of flooding is essential in planning recreational facilities.

Camp areas are tracts of land used intensively as sites for tents, trailers, and campers and for outdoor activities that accompany such sites. These areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The soils are rated on the basis of soil properties that influence the ease of developing camp areas and performance of the areas after development. Also considered are the soil properties that influence trafficability and promote the growth of vegetation after heavy use.

Picnic areas are natural or landscaped tracts of land that are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The soils are rated on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation after development. The surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Playgrounds are areas used intensively for baseball, football, or similar activities (fig. 1). These areas require a nearly level soil that is free of stones and that can withstand heavy foot traffic and maintain an adequate cover of vegetation. The soils are rated

on the basis of soil properties that influence the cost of shaping the site, trafficability, and the growth of vegetation. Slope and stoniness are the main concerns in developing playgrounds. The surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry.

Paths and trails are areas used for hiking and horseback riding. The areas should require little or no cutting and filling during site preparation. The soils are rated on the basis of soil properties that influence trafficability and erodibility. Paths and trails should remain firm under foot traffic and not be dusty when dry.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

The interpretive ratings in this table help engineers, planners, and others to understand how soil properties influence recreational uses. Ratings for proposed uses are given in terms of limitations. Only the most restrictive features are listed. Other features may limit a specific recreational use.

The degree of soil limitation is expressed as slight, moderate, or severe.

Slight means that soil properties are favorable for the rated use. The limitations are minor and can be easily overcome. Good performance and low maintenance are expected.

Moderate means that soil properties are moderately favorable for the rated use. The limitations can be overcome or modified by special planning, design, or maintenance. During some part of the year, the expected performance may be less desirable than that of soils rated *slight*.

Severe means that soil properties are unfavorable for the rated use. Examples of limitations are slope, bedrock near the surface, flooding, and a seasonal high water table. These limitations generally require major soil reclamation, special design, or intensive



Figure 1.—A playground in Round Prairie County Park, in an area of Weller silty clay loam, 5 to 9 percent slopes, moderately eroded.

maintenance. Overcoming the limitations generally is difficult and costly.

The information in the table "Recreational Development" can be supplemented by other information in this survey, for example,

interpretations for dwellings without basements and for local roads and streets in the table "Building Site Development" and interpretations for septic tank absorption fields in the table "Sanitary Facilities."

Recreational Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
13B: Olmitz-----	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
Vesser-----	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Zook-----	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
23C2: Arispe-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
24D2: Shelby-----	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight-----	Moderate: slope.
41B: Sparta-----	Moderate: too sandy.	Moderate: too sandy.	Moderate: slope, small stones.	Moderate: too sandy.	Moderate: droughty.
51: Vesser-----	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
51B: Vesser-----	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
54: Zook-----	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
65D2: Lindley-----	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight-----	Moderate: slope.
65E, 65E2, 65P2: Lindley-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
65G: Lindley-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
74: Rubio-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
75: Givin-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight-----	Slight.
75B: Givin-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight-----	Slight.
76B: Ladoga-----	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight-----	Slight.
76C2: Ladoga-----	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight-----	Slight.
76D2: Ladoga-----	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight-----	Moderate: slope.
80B: Clinton-----	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
80C2: Clinton-----	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
80D2: Clinton-----	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
87B: Colo-----	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Zook-----	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
122: Sperry-----	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
130: Belinda-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
131B, 131B2: Pershing-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
131C2: Pershing-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
132B: Weller-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
132C, 132C2: Weller-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
132D, 132D2: Weller-----	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
139: Perks-----	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
179D2: Gara-----	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight-----	Moderate: slope.
179E2: Gara-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
180: Keomah-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Slight-----	Slight.
180B: Keomah-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight-----	Slight.
208: Klum-----	Severe: flooding.	Slight-----	Moderate: flooding.	Slight-----	Moderate: flooding.
211: Edina-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
220: Nodaway-----	Severe: flooding.	Slight-----	Moderate: flooding.	Slight-----	Moderate: flooding.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
222C, 222C2: Clarinda-----	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
223C2: Rinda-----	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
260: Beckwith-----	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
263: Okaw-----	Severe: flooding, ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
264B: Ainsworth-----	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
273B: Olmits-----	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
279: Taintor-----	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
280: Mahaska-----	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight-----	Slight.
280B: Mahaska-----	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight-----	Slight.
281B, 281B2: Otley-----	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.
281C, 281C2: Otley-----	Slight-----	Slight-----	Severe: slope.	Slight-----	Slight.
293C: Chelsea-----	Moderate: too sandy.	Moderate: too sandy.	Severe: slope.	Moderate: too sandy.	Moderate: droughty.
Fayette-----	Slight-----	Slight-----	Severe: slope.	Slight-----	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
293P:					
Chelsea-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too sandy, slope.	Severe: slope.
Fayette-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
313E2:					
Gosport-----	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope, depth to rock.
313G:					
Gosport-----	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, erodes easily.	Severe: slope.
315:					
Nodaway-----	Severe: flooding.	Slight-----	Moderate: flooding.	Slight-----	Moderate: flooding.
Klum-----	Severe: flooding.	Slight-----	Moderate: flooding.	Slight-----	Moderate: flooding.
Perks-----	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
362, 363:					
Haig-----	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
364B, 364B2:					
Grundy-----	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Moderate: wetness.	Moderate: wetness.
423D2:					
Bucknell-----	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
424D2:					
Lindley-----	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight-----	Moderate: slope.
Keswick-----	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
424E2:					
Lindley-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Keswick-----	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: erodes easily.	Severe: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
425D: Koswick-----	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness, slope.
425D2: Koswick-----	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
430: Ackmore-----	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
453: Tuskeego-----	Severe: flooding, wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
499G: Nordness-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
520: Coppock-----	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
520B: Coppock-----	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
570C2: Nira-----	Slight-----	Slight-----	Severe: slope.	Slight-----	Slight.
571C2: Hedrick-----	Slight-----	Slight-----	Severe: slope.	Slight-----	Slight.
572C2: Inton-----	Slight-----	Slight-----	Severe: slope.	Severe: erodes easily.	Slight.
572D2: Inton-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
587: Chequest-----	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
594D2: Galland-----	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
729:					
Nodaway-----	Severe: flooding.	Slight-----	Moderate: flooding.	Slight-----	Moderate: flooding.
Coppock-----	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
730B:					
Nodaway-----	Severe: flooding.	Slight-----	Moderate: slope, flooding.	Slight-----	Moderate: flooding.
Coppock-----	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Cantril-----	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight-----	Slight.
779:					
Kalona-----	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
792C2:					
Armstrong-----	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness.
792D2:					
Armstrong-----	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness, slope.
795C2:					
Ashgrove-----	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
795D2:					
Ashgrove-----	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
822D2:					
Lamoni-----	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
831B:					
Perishing-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
831C2:					
Perishing-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
832B: Weller-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
832C2: Weller-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
832D2: Weller-----	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
876B: Ladoga-----	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight-----	Slight.
876C2: Ladoga-----	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Slight-----	Slight.
880B: Clinton-----	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
880C2: Clinton-----	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Slight.
880D2: Clinton-----	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
977: Richwood-----	Slight-----	Slight-----	Slight-----	Slight-----	Slight.
993D2: Gara-----	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight-----	Moderate: slope.
Armstrong-----	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness.	Moderate: wetness, slope.
993E2: Gara-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Armstrong-----	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Moderate: wetness, slope.	Severe: slope.

Recreational Development--Continued

Map symbol and soil name	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
994D2: Galland-----	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
Douds-----	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight-----	Moderate: slope.
994E2: Galland-----	Severe: slope, wetness.	Severe: slope.	Severe: slope, wetness.	Severe: erodes easily.	Severe: slope.
Douds-----	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
1075B: Givin-----	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Slight-----	Slight.
1130: Belinda-----	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
1260: Beckwith-----	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
1715: Nodaway-----	Severe: flooding.	Slight-----	Moderate: flooding.	Slight-----	Moderate: flooding.
Vesser-----	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
Ackmore-----	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
5020: Pits and Dumps--	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, depth to rock.
5030: Pits-----	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
5040: Orthents-----	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.

Wildlife Habitat

Jefferson County supports a variety of wildlife species. These resources provide opportunities for hunting, fishing, and wildlife observation and thus have a positive effect on the local economy. Some species, such as songbirds, hawks, owls, snakes, and other predators, provide additional benefits by controlling rodents and undesirable insects.

Both the diversity and abundance of wildlife in Jefferson County are indirectly affected by soil types through their influence on vegetation and land use. Topography also plays a role in determining the types and abundance of wildlife throughout the county. The nearly level Taintor and Haig soils are rowcropped intensively and provide only limited shelter and nesting areas for wildlife unless special provisions are made. These provisions could include leaving brushy or herbaceous fence rows undisturbed, delaying mowing of set-aside areas and other odd areas, and planting wildlife food and cover plots. The moderately steep and steep areas throughout the county, such as areas of Lindley and Gara soils, are important to wildlife because they are generally cropped less intensively than some other areas. The interspersed woodlands, pastures, brushy ravines, and croplands associated with these steeper soils results in more diverse and abundant wildlife resources.

Pheasant, cottontail rabbit, raccoon, skunk, and opossum are generally abundant in the upland flats and in the moderately sloping areas of the county. White-tailed deer and bobwhite quail are abundant in areas of the Clinton-Lindley-Ashgrove and Weller-Lindley associations, where the flat uplands break off into moderately sloping or steeper topography. Wild turkeys are abundant in the more extensive woodlands associated with the steeper soils, such as Lindley loam, 25 to 40 percent slopes. Mink, muskrat, and some beaver frequent the Skunk River and creeks throughout the county. The remaining undrained wetland areas along the Skunk River and other streams provide habitat for waterfowl and other wetland wildlife. The most common nesting waterfowl species is the wood duck, which nests in hollow trees along the larger streams and along the Skunk

River. Old bayous, cut-off channels, and other shallow water areas along these streams provide important brood areas where young wood ducks can find food and protection from predators. Various other marsh birds, including herons, egrets, and shorebirds, use these shallow water areas for feeding or nesting. Giant Canada geese nest on some of the larger farm ponds in the county.

The Nodaway and Coppock soils on bottom land provide sites for dikes and shallow water impoundments, which can improve habitat for waterfowl and other wetland wildlife. Fish, mainly bullheads and carp, are fairly plentiful in the streams throughout the county. Channel catfish are a sought-after species in the Skunk River (fig. 2). Many privately owned artificial ponds are well distributed throughout the county. The well managed ponds provide excellent fishing for largemouth bass, bluegill, and channel catfish. Internal drainage, available water capacity, texture of the subsoil, and permeability are important factors affecting the selection of sites for farm ponds and shallow water areas for waterfowl. The city of Fairfield's waterworks reservoir number 1 and reservoir number 2 and Walton Lake provide excellent fishing opportunities within a short distance from Fairfield.

Many areas in the county could be improved or developed as wildlife habitat. Small irregularly shaped areas of limited value for other uses could be developed as wildlife habitat by planting trees, shrubs, and native grasses or by merely fencing the area and allowing natural succession to occur. Woodlands can be made more productive for timber and wildlife by excluding livestock. Reducing or eliminating fall tillage of cropland protects the land from erosion and provides winter food for wildlife. Incorporating islands and other features in the design of new farm ponds and shallow water areas can provide safe nesting areas for Canada geese and other waterfowl.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. If food, cover, or water is missing, inadequate, or



Figure 2.—The soils on bottom land along the Skunk River, in northeastern Jefferson County, provide good wildlife habitat. The river supports many species of fish.

inaccessible, wildlife will be scarce or will not inhabit the area.

If the soils have potential for habitat development, wildlife habitat can be created or improved by planting appropriate vegetation, properly managing the existing plant cover, and fostering the natural establishment of desirable plants.

Elements of Wildlife Habitat

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants used by wildlife.

Examples are corn, soybeans, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes planted for wildlife food and cover. Examples are brome grass, timothy, orchardgrass, clover, alfalfa, wheatgrass, and birdsfoot trefoil.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Examples are bluestems, indiangrass, goldenrod, lambsquarters, dandelions, blackberry, ragweed, wheatgrass, and nightshade.

The major soil properties affecting the growth of grain and forage crops and wild herbaceous plants

are depth of the root zone, texture of the surface layer, the amount of water available to plants, wetness, salinity, and flooding. The length of the growing season also is important.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage that wildlife eat. Examples are oak, poplar, box elder, birch, maple, green ash, willow, and American elm. Examples of fruit-producing shrubs that are suitable for planting on soils that have good potential for these plants are honeysuckle, American plum, redosier dogwood, chokecherry, highbush cranberry, elderberry, blackberry, raspberry, gooseberry, silver buffaloberry, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover that provides habitat or supplies food in the form of browse, seed, or fruit-like cones. Examples are pine, spruce, and redcedar.

The major soil properties affecting the growth of hardwood and coniferous trees and shrubs are depth of the root zone, the amount of water available to plants, and wetness.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Wetland plants produce food or cover for wetland wildlife. Examples of these plants are smartweeds, wild millet, rushes, sedges, bulrushes, arrowhead, waterplantain, cattail, prairie cordgrass, bluejoint grass, asters, and beggarticks.

The major soil properties affecting wetland plants are texture of the surface layer, wetness, acidity or alkalinity, and slope.

Shallow water areas have an average depth of less than 5 feet. They are useful as habitat for some wildlife species. They are naturally wet areas or are created by dams, levees, or water-control measures in marshes or streams. Examples are waterfowl feeding areas, wildlife watering developments, beaver ponds, and other wildlife ponds.

The major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability.

Kinds of Wildlife Habitat

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, and shrubs. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include Hungarian partridge, ring-necked pheasant, bobwhite quail, meadowlark, field sparrow, killdeer, cottontail rabbit, and red fox.

Habitat for woodland wildlife consists of areas of hardwoods or conifers or a mixture of these and associated grasses, legumes, and wild herbaceous plants. The wildlife attracted to this habitat include wild turkey, ruffed grouse, thrushes, woodpeckers, owls, tree squirrels, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas, bogs, or flood plains that support water-tolerant plants. The wildlife attracted to this habitat include ducks, geese, herons, bitterns, rails, kingfishers, muskrats, otter, mink, and beaver.

Wildlife Habitat

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life
13B:										
Olmitz-----	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
Vesser-----	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Zook-----	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
23C2:										
Arispe-----	Good	Good	Good	Good	Good	Very poor.	Poor	Good	Good	Very poor.
24D2:										
Shelby-----	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
41B:										
Sparta-----	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
51, 51B:										
Vesser-----	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
54:										
Zook-----	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
65D2:										
Lindley-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
65E, 65E2, 65F2:										
Lindley-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
65G:										
Lindley-----	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
74:										
Rubio-----	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
75, 75B:										
Givin-----	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
76B:										
Ladoga-----	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
76C2, 76D2:										
Ladoga-----	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
80B:										
Clinton-----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
80C2, 80D2:										
Clinton-----	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life
87B:										
Colo-----	Good	Fair	Good	Fair	Poor	Fair	Very poor.	Fair	Fair	Good.
Zook-----	Good	Fair	Good	Fair	Poor	Good	Good	Fair	Fair	Good.
122:										
Sperry-----	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
130:										
Belinda-----	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
131B, 131B2:										
Pershing-----	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
131C2:										
Pershing-----	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
132B:										
Weller-----	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
132C, 132C2, 132D, 132D2:										
Weller-----	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
139:										
Perks-----	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
179D2:										
Gara-----	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Poor.
179E2:										
Gara-----	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
180, 180B:										
Keomah-----	Good	Good	Fair	Fair	Fair	Fair	Fair	Good	Fair	Fair.
208:										
Klum-----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
211:										
Edina-----	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
220:										
Nodaway-----	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
222C, 222C2:										
Clarinda-----	Poor	Fair	Poor	Fair	Poor	Poor	Poor	Fair	Fair	Poor.
223C2:										
Rinda-----	Poor	Fair	Poor	Fair	Poor	Very poor.	Very poor.	Fair	Fair	Very poor.
260:										
Beckwith-----	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life
263: Okaw-----	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
264B: Ainsworth-----	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
273B: Olmitz-----	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
279: Taintor-----	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
280, 280B: Mahaska-----	Good	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
281B, 281B2: Otley-----	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
281C, 281C2: Otley-----	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
293C: Chelsea-----	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Fayette-----	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
293F: Chelsea-----	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Fayette-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
313E2, 313G: Gosport-----	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
315: Nodaway-----	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
Klum-----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Perks-----	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
362, 363: Raig-----	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
364B, 364B2: Grundy-----	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
423D2: Bucknell-----	Fair	Good	Fair	Good	Fair	Poor	Poor	Fair	Good	Very poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life
424D2:										
Lindley-----	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Keswick-----	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
424E2:										
Lindley-----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Keswick-----	Poor	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
425D, 425D2:										
Keswick-----	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
430:										
Ackmore-----	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
453:										
Tuskeego-----	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
499G:										
Nordness-----	Very poor.	Poor	Poor	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
520, 520B:										
Coppock-----	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
570C2:										
Nira-----	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
571C2:										
Hedrick-----	Fair	Good	Fair	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
572C2, 572D2:										
Inton-----	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
587:										
Chequest-----	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
594D2:										
Galland-----	Fair	Good	Fair	Good	Fair	Very poor.	Poor	Fair	Good	Very poor.
729:										
Nodaway-----	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
Coppock-----	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
730B:										
Nodaway-----	Good	Good	Good	Good	Fair	Fair	Poor	Fair	Good	Fair.
Coppock-----	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Cantril-----	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

Wildlife Habitat--Continued

Map symbol and soil name	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hard- wood trees	Conif- erous plants	Wetland plants	Shallow water areas	Open- land wild- life	Wood- land wild- life	Wetland wild- life
779: Kalona-----	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
792C2, 792D2: Armstrong-----	Fair	Good	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
795C2, 795D2: Ashgrove-----	Poor	Fair	Poor	Fair	Poor	Poor	Poor	Fair	Fair	Poor.
822D2: Lamoni-----	Fair	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
831B: Pershing-----	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
831C2: Pershing-----	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
832B: Weller-----	Good	Good	Fair	Fair	Fair	Poor	Poor	Good	Fair	Poor.
832C2, 832D2: Weller-----	Fair	Fair	Fair	Fair	Fair	Very poor.	Poor	Fair	Fair	Very poor.
876B: Ladoga-----	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
876C2: Ladoga-----	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Very poor.
880B: Clinton-----	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
880C2, 880D2: Clinton-----	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
977: Richwood-----	Good	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
993D2: Gara-----	Fair	Good	Fair	Good	Good	Very poor.	Poor	Fair	Good	Poor.
Armstrong-----	Fair	Good	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
993E2: Gara-----	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Armstrong-----	Poor	Fair	Fair	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.

Wildlife Habitat--Continued

[illegible]

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial,

industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

The table "Building Site Development" shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties,

site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, potential for frost action, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock, the available water capacity in the upper 40 inches, and the content of salts affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

The table "Sanitary Facilities" shows the degree and the kind of soil limitations that affect septic tank

absorption fields, sewage lagoons, and sanitary landfills. It also shows the suitability of the soils for use as a daily cover for landfill.

Soil properties are important in selecting sites for sanitary facilities and in identifying limiting soil properties and site features to be considered in planning, design, and installation. Soil limitation ratings of *slight*, *moderate*, or *severe* are given for septic tank absorption fields, sewage lagoons, and trench and area sanitary landfills. Soil suitability ratings of *good*, *fair*, and *poor* are given for daily cover for landfill.

A rating of *slight* or *good* indicates that the soils have no limitations or that the limitations can be easily overcome. Good performance and low maintenance can be expected. A rating of *moderate* or *fair* indicates that the limitations should be recognized but generally can be overcome by good management or special design. A rating of *severe* or *poor* indicates that overcoming the limitations is difficult or impractical. Increased maintenance may be required.

Septic tank absorption fields are areas in which subsurface systems of tile or perforated pipe distribute effluent from a septic tank into the natural soil. The centerline of the tile is assumed to be at a depth of 24 inches. Only the part of the soil between depths of 24 and 60 inches is considered in making the ratings. The soil properties and site features considered are those that affect the absorption of the effluent, those that affect the construction and maintenance of the system, and those that may affect public health.

The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a

nearly level floor surrounded by cut slopes or embankments of compacted, relatively impervious soil material. Aerobic lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Relatively impervious soil material for the lagoon floor and sides is desirable to minimize seepage and contamination of local ground water.

The table "Sanitary Facilities" gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope and bedrock can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Trench sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil that is excavated from the trench. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. Soil properties that influence the risk of pollution, the ease of excavation, trafficability, and revegetation are the major considerations in rating the soils.

Area sanitary landfill is an area where solid waste is disposed of by placing refuse in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil that is imported from a source away from the site. A final cover of soil at least 2 feet thick is placed over the completed landfill. Soil properties that influence trafficability, revegetation, and the risk of pollution are the main considerations in rating the soils for area sanitary landfills.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. The ratings in the table "Sanitary Facilities" are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect both types of landfill. Texture, stones

and boulders, highly organic layers, soil reaction, and content of salts affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The suitability of a soil for use as cover is based on properties that affect workability and the ease of digging, moving, and spreading the material over the refuse daily during both wet and dry periods.

Soil texture, wetness, rock fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Waste Management

Soil properties are important when organic waste is applied as fertilizer and wastewater is applied in irrigated areas. They also are important when the soil is used as a medium for the treatment and disposal of the organic waste and wastewater. Unfavorable soil properties can result in environmental damage.

The use of organic waste and wastewater as production resources results in energy and resource conservation and minimizes the problems associated with waste disposal. If disposal is the goal, applying a maximum amount of the organic waste or the wastewater to a minimal area holds costs to a minimum and environmental damage is the main hazard. If reuse is the goal, a minimum amount should be applied to a maximum area and environmental damage is unlikely.

Interpretations developed for waste management may include ratings for manure- and food-processing waste, municipal sewage sludge, use of wastewater for irrigation, and treatment of wastewater by slow rate, overland flow, and rapid infiltration processes.

Specific information regarding waste management is available at the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

Construction Materials

The table "Construction Materials" gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good*, *fair*, or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In the table "Construction Materials," the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel, or both. They have at least 5 feet of suitable material, a low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have a moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have one or more of the following characteristics: a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet and have a water table at a depth of less than 1 foot. They may have layers of

suitable material, but the material is less than 3 feet thick.

Sand and *gravel* are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In the table "Construction Materials," only the probability of finding material in suitable quantity in or below the soil is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable, loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal high water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

The table "Water Management" gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In the table "Water Management," the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the

embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock. The performance of a system is affected by the depth of the root zone, the amount of salts, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff.

Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an

excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock

affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Building Site Development

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
13B: Olmitz-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Vesser-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Zook-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
23C2: Arispe-----	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
24D2: Shelby-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
41B: Sparta-----	Severe: cutbanks cave.	Slight-----	Slight-----	Slight-----	Slight-----	Moderate: droughty.
51: Vesser-----	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
51B: Vesser-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
54: Zook-----	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
65D2: Lindley-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
65E, 65E2, 65P2, 65Q: Lindley-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
74: Rubio-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
75, 75B: Givin-----	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
76B: Ladoga-----	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
76C2: Ladoga-----	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
76D2: Ladoga-----	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
80B: Clinton-----	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
80C2: Clinton-----	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
80D2: Clinton-----	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
87B: Colo-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Zook-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
122: Sperry-----	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
130: Belinda-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
131B, 131B2, 131C2: Pershing-----	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
132B, 132C, 132C2: Weller-----	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
132D, 132D2: Weller-----	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, frost action.	Moderate: slope.
139: Perks-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty.
179D2: Gara-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
179E2: Gara-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
180, 180B: Keomah-----	Severe: wetness.	Severe: shrink-swell.	Severe: wetness.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
208: Klum-----	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
211: Edina-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
220: Nodaway-----	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
222C: Clarinda-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
222C2: Clarinda-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.
223C2: Rinda-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
260: Beckwith-----	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
263: Okaw-----	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
264B: Ainsworth-----	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
273B: Olmitz-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
279: Taintor-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
280, 280B: Mahaska-----	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
281B, 281B2: Otley-----	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
281C, 281C2: Otley-----	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
293C: Chelsea-----	Severe: cutbanks cave.	Slight-----	Slight-----	Moderate: slope.	Slight-----	Moderate: droughty.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
293C: Fayette-----	Slight-----	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
293F: Chelsea-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Fayette-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
313E2: Gosport-----	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Moderate: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: slope, depth to rock.
313G: Gosport-----	Severe: wetness, slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
315: Nodaway-----	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
Klum-----	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Perks-----	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty.
362, 363: Haig-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
364B, 364B2: Grundy-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
423D2: Bucknell-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
424D2: Lindley-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
424D2: Keswick-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
424E2: Lindley-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Keswick-----	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
425D, 425D2: Keswick-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
430: Ackmore-----	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
453: Tuskeego-----	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
499G: Nordness-----	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, shrink-swell, low strength.	Severe: slope, depth to rock.
520: Coppock-----	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
520B: Coppock-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
570C2: Nira-----	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
571C2: Hedrick-----	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
572C2: Inton-----	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
572D2: Inton-----	Moderate: wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
587: Chaquest-----	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: shrink-swell, low strength, flooding.	Moderate: wetness, flooding.
594D2: Galland-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
729: Nodaway-----	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
Coppock-----	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
730B: Nodaway-----	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
Coppock-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Cantril-----	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness.	Severe: low strength, frost action.	Slight.
779: Kalona-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
792C2: Armstrong-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
792D2: Armstrong-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
795C2: Ashgrove-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
795D2: Ashgrove-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness, slope.
822D2: Lamoni-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
831B, 831C2: Pershing-----	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
832B, 832C2: Weller-----	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, low strength, frost action.	Slight.
832D2: Weller-----	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, frost action.	Moderate: slope.
876B: Ladoga-----	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
876C2: Ladoga-----	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
880B: Clinton-----	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
880C2: Clinton-----	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
880D2: Clinton-----	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
977: Richwood-----	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: frost action, low strength.	Slight.
993D2: Gara-----	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Armstrong-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
993E2: Gara-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Armstrong-----	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: wetness, slope, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
994D2: Galland-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope.
Douds-----	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: wetness, slope.	Severe: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: slope.
994E2: Galland-----	Severe: wetness, slope.	Severe: wetness, shrink-swell, slope.	Severe: wetness, slope, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
Douds-----	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
1075B: Givin-----	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
1130: Belinda-----	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.

Building Site Development--Continued

Map symbol and soil name	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
1260: Beckwith-----	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
1715: Nodaway-----	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
Vesser-----	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
Ackmore-----	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Moderate: wetness, flooding.
5020: Pits and Dumps--	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
5030: Pits-----	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.
5040: Orthents-----	Slight-----	Slight-----	Slight-----	Moderate: slope.	Slight-----	Slight.

Sanitary Facilities

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
13B:					
Olmitz-----	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
Vesser-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Zook-----	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
23C2:					
Arispe-----	Severe: wetness, percs slowly.	Severe: slope, wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Poor: hard to pack.
24D2:					
Shelby-----	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
41B:					
Sparta-----	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
51:					
Vesser-----	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
51B:					
Vesser-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
54:					
Zook-----	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
65D2:					
Lindley-----	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
65E, 65E2, 65P2, 65Q:					
Lindley-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
74:					
Rubio-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
75, 75B: Olvin-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
76B: Ladoga-----	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
76C2: Ladoga-----	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
76D2: Ladoga-----	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
80B: Clinton-----	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
80C2: Clinton-----	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
80D2: Clinton-----	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
87B: Colo-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Zook-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
122: Sperry-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
130: Belinda-----	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
131B, 131B2: Pershing-----	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
131C2: Pershing-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
132B: Weller-----	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
132C, 132C2: Weller-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
132D, 132D2: Weller-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
139: Perks-----	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
179D2: Gara-----	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
179E2: Gara-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
180, 180B: Keomah-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
208: Klum-----	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage.
211: Edina-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
220: Nodaway-----	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
222C: Clarinda-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
222C2: Clarinda-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
223C2: Rinda-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
260: Beckwith-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
263: Okaw-----	Severe: ponding, percs slowly.	Slight-----	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
264B: Ainsworth-----	Severe: percs slowly.	Severe: seepage.	Severe: seepage.	Slight-----	Poor: hard to pack.
273B: Olmitz-----	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.
279: Taintor-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
280, 280B: Mahaska-----	Severe: wetness.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
281B, 281B2: Otley-----	Moderate: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
281C, 281C2: Otley-----	Moderate: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
293C: Chelsea-----	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Fayette-----	Moderate: percs slowly.	Severe: slope.	Moderate: too clayey.	Slight-----	Fair: too clayey.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
293F:					
Chelsea-----	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.
Fayette-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
313E2:					
Gosport-----	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
313G:					
Gosport-----	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
315:					
Nodaway-----	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Klum-----	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, seepage, wetness.	Severe: flooding, seepage, wetness.	Poor: seepage.
Perks-----	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
362, 363:					
Haig-----	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
364B, 364B2:					
Grundy-----	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
423D2:					
Bucknell-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
424D2:					
Lindley-----	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Keswick-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
424E2: Lindley-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Keswick-----	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope.	Severe: wetness, slope.	Poor: slope, wetness.
425D, 425D2: Keswick-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
430: Ackmore-----	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
453: Tuskeego-----	Severe: wetness, percs slowly.	Slight-----	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
499G: Nordness-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
520: Coppock-----	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
520B: Coppock-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
570C2: Nira-----	Moderate: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Poor: hard to pack.
571C2: Hedrick-----	Moderate: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Poor: hard to pack.
572C2: Inton-----	Moderate: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Poor: hard to pack.
572D2: Inton-----	Moderate: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness.	Moderate: wetness, slope.	Poor: hard to pack.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
587: Chequest-----	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
594D2: Galland-----	Severe: wetness, percs slowly.	Severe: seepage, slope.	Severe: seepage, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
729: Nodaway-----	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Coppock-----	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.
730B: Nodaway-----	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Coppock-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
Cantril-----	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
779: Kalona-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
792C2, 792D2: Armstrong-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
795C2, 795D2: Ashgrove-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
822D2: Lamoni-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
831B: Pershing-----	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
831C2: Pershing-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
832B: Weller-----	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
832C2: Weller-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
832D2: Weller-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
876B: Ladoga-----	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
876C2: Ladoga-----	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
NE0B: Clinton-----	Severe: percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
880C2: Clinton-----	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
880D2: Clinton-----	Severe: percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
977: Richwood-----	Slight-----	Severe: seepage.	Severe: seepage.	Slight-----	Fair: too clayey, thin layer.
993D2: Gara-----	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Armstrong-----	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
993E2:					
Gara-----	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Armstrong-----	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness, slope, too clayey.	Severe: wetness, slope.	Poor: too clayey, hard to pack, slope.
994D2:					
Galland-----	Severe: wetness, percs slowly.	Severe: seepage, slope.	Severe: seepage, wetness.	Severe: wetness.	Poor: too clayey, hard to pack.
Douds-----	Moderate: wetness, percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, wetness.	Severe: seepage.	Fair: too clayey, too sandy, slope.
994E2:					
Galland-----	Severe: wetness, percs slowly, slope.	Severe: seepage, slope.	Severe: seepage, wetness, slope.	Severe: wetness, slope.	Poor: too clayey, hard to pack, slope.
Douds-----	Severe: slope.	Severe: seepage, slope.	Severe: seepage, wetness, slope.	Severe: seepage, slope.	Poor: slope.
1075B:					
Givin-----	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
1130:					
Belinda-----	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
1260:					
Beckwith-----	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
1715:					
Nodaway-----	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
Vesser-----	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Ackmore-----	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: hard to pack, wetness.

Sanitary Facilities--Continued

Map symbol and soil name	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
5020: Pits and Dumps--	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
5030: Pits-----	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
5040: Orthents-----	Moderate: percs slowly.	Moderate: seepage, slope.	Slight-----	Slight-----	Good.

Construction Materials

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
13B: Olmits-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Vesser-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Zook-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
23C2: Arispe-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
24D2: Shelby-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
41B: Sparta-----	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
51, 51B: Vesser-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
54: Zook-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
65D2: Lindley-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
65E, 65E2, 65F2: Lindley-----	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
65G: Lindley-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
74: Rubio-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
75, 75B: Givin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
76B, 76C2, 76D2: Ladoga-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
80B, 80C2, 80D2: Clinton-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
87B: Colo-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Zook-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
122: Sperry-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
130: Belinda-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
131B, 131B2, 131C2: Pershing-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
132B, 132C, 132C2, 132D, 132D2: Weller-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
139: Perks-----	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
179D2: Gara-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
179E2: Gara-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
180, 180B: Keomah-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
208: Klum-----	Good-----	Probable-----	Improbable: too sandy.	Good.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
211: Edina-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
220: Nodaway-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
222C, 222C2: Clarinda-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
223C2: Rinda-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
260: Beckwith-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
263: Okaw-----	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
264B: Ainsworth-----	Good-----	Probable-----	Improbable: too sandy.	Fair: too clayey.
273B: Olmitz-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
279: Taintor-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
280, 280B: Mahaska-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
281B, 281B2, 281C, 281C2: Otley-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
293C: Chelsea-----	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
Fayette-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
293F: Chelsea-----	Fair: slope.	Probable-----	Improbable: too sandy.	Poor: too sandy, slope.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
293F: Fayette-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
313E2: Gosport-----	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
313G: Gosport-----	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
315: Nodaway-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Klum-----	Good-----	Probable-----	Improbable: too sandy.	Good.
Perks-----	Good-----	Probable-----	Improbable: too sandy.	Poor: too sandy.
362, 363: Haig-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
364B, 364B2: Grundy-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
423D2: Bucknell-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
424D2: Lindley-----	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Keswick-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
424E2: Lindley-----	Fair: shrink-swell, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Keswick-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
425D: Keswick-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
425D2: Keswick-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
430: Ackmore-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
453: Tuskeego-----	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
499G: Nordness-----	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
520: Coppock-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
520B: Coppock-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
570C2: Nira-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
571C2: Hedrick-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
572C2: Inton-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
572D2: Inton-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
587: Chequest-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
594D2: Galland-----	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
729: Nodaway-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Coppock-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
730B: Nodaway-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Coppock-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
730B: Cantril-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
779: Kalona-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
792C2, 792D2: Armstrong-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
795C2, 795D2: Ashgrove-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
822D2: Lamoni-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
831B, 831C2: Pershing-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
832B, 832C2, 832D2: Weller-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
876B, 876C2: Ladoga-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
880B, 880C2, 880D2: Clinton-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
977: Richwood-----	Good-----	Probable-----	Improbable: too sandy.	Good.
993D2: Gara-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Armstrong-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
993E2: Gara-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Armstrong-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.

Construction Materials--Continued

Map symbol and soil name	Roadfill	Sand	Gravel	Topsoil
994D2: Galland-----	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Douds-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
994E2: Galland-----	Fair: wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Douds-----	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
1075B: Givin-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
1130: Belinda-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
1260: Beckwith-----	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
1715: Nodaway-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Vesser-----	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ackmore-----	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
5020: Pits and Dumps--	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
5030: Pits-----	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
5040: Orthents-----	Good-----	Improbable: excess fines.	Improbable: excess fines.	Good.

Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
13B: Olmitz-----	Moderate: seepage, slope.	Slight-----	Severe: no water.	Deep to water	Slope-----	Favorable-----	Favorable.
Vesser-----	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Zook-----	Slight-----	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
23C2: Arispe-----	Moderate: seepage, slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
24D2: Shelby-----	Severe: slope.	Slight-----	Severe: no water.	Deep to water	Slope-----	Slope-----	Slope.
41B: Sparta-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
51: Vesser-----	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
51B: Vesser-----	Moderate: seepage, slope.	Severe: wetness.	Moderate: slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
54: Zook-----	Slight-----	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, flooding, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
65D2, 65E, 65E2, 65F2, 65G: Lindley-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope-----	Slope-----	Slope.

Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
74: Rubio-----	Slight-----	Severe: wetness.	Severe: no water.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily, percs slowly.
75: Givin-----	Slight-----	Moderate: hard to pack, wetness.	Severe: slow refill.	Frost action--	Wetness-----	Erodes easily, wetness.	Erodes easily.
75B: Givin-----	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.
76B, 76C2: Ladoga-----	Moderate: seepage, slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope-----	Erodes easily	Erodes easily.
76D2: Ladoga-----	Severe: slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope-----	Slope, erodes easily.	Slope, erodes easily.
80B, 80C2: Clinton-----	Moderate: seepage, slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
80D2: Clinton-----	Severe: slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
87B: Colo-----	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Frost action--	Wetness-----	Wetness-----	Wetness.
Zook-----	Slight-----	Severe: hard to pack, wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
122: Sperry-----	Slight-----	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.

Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
130: Belinda-----	Slight-----	Severe: wetness.	Severe: slow refill.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
131B, 131B2: 131C2: Pershing-----	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
132B, 132C, 132C2: Weller-----	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
132D, 132D2: Weller-----	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
139: Perks-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty, rooting depth.
179D2, 179E2: Gara-----	Severe: slope.	Slight-----	Severe: no water.	Deep to water	Slope, rooting depth.	Slope-----	Slope, rooting depth.
180: Keomah-----	Slight-----	Moderate: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
180B: Keomah-----	Moderate: slope.	Moderate: wetness.	Severe: slow refill.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
208: Klum-----	Severe: seepage.	Severe: seepage, piping.	Moderate: deep to water.	Deep to water	Soil blowing, flooding.	Soil blowing---	Favorable.
211: Edina-----	Slight-----	Severe: hard to pack, wetness.	Severe: no water.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir seepage	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
220: Nodaway-----	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Flooding-----	Erodes easily	Erodes easily.
222C, 222C2: Clarinda-----	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
223C2: Rinda-----	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
260: Beckwith-----	Slight-----	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
263: Okaw-----	Slight-----	Severe: hard to pack, ponding.	Severe: slow refill.	Ponding, percs slowly.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
264B: Ainsworth-----	Severe: seepage.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
273B: Olmitz-----	Moderate: seepage, slope.	Slight-----	Severe: no water.	Deep to water	Slope-----	Favorable-----	Favorable.
279: Taintor-----	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action---	Wetness-----	Erodes easily, wetness.	Wetness, erodes easily.
280: Mahaska-----	Moderate: seepage.	Severe: hard to pack.	Moderate: deep to water, slow refill.	Frost action---	Wetness-----	Erodes easily, wetness.	Erodes easily.
280B: Mahaska-----	Moderate: seepage, slope.	Severe: hard to pack.	Moderate: deep to water, slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.

Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
281B, 281B2, 281C, 281C2: Otley-----	Moderate: seepage, slope.	Moderate: hard to pack.	Moderate: deep to water, slow refill.	Deep to water	Slope-----	Erodes easily	Erodes easily.
293C: Chelsea-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Too sandy, soil blowing.	Droughty.
Fayette-----	Moderate: seepage, slope.	Slight-----	Severe: no water.	Deep to water	Slope-----	Erodes easily	Erodes easily.
293F: Chelsea-----	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, droughty, fast intake.	Slope, too sandy, soil blowing.	Slope, droughty.
Fayette-----	Severe: slope.	Slight-----	Severe: no water.	Deep to water	Slope-----	Slope, erodes easily.	Slope, erodes easily.
313E2: Gosport-----	Severe: slope.	Slight-----	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
313G: Gosport-----	Severe: slope.	Slight-----	Severe: no water.	Percs slowly, depth to rock, slope.	Slope, wetness, percs slowly.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
315: Nodaway-----	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Flooding-----	Erodes easily	Erodes easily.
Klum-----	Severe: seepage.	Severe: seepage, piping.	Moderate: deep to water.	Deep to water	Soil blowing, flooding.	Soil blowing---	Favorable.
Perks-----	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Droughty, fast intake.	Too sandy, soil blowing.	Droughty, rooting depth.

Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
362, 363: Haig-----	Slight-----	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
364B, 364B2: Grundy-----	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Wetness, percs slowly, slope.	Erodes easily, wetness.	Wetness, erodes easily.
423D2: Bucknell-----	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
424D2, 424E2: Lindley-----	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope-----	Slope-----	Slope.
Keswick-----	Severe: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
425D, 425D2: Keswick-----	Severe: slope.	Moderate: wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
430: Ackmore-----	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, flooding.	Wetness-----	Wetness.
453: Tuskeego-----	Slight-----	Severe: wetness.	Severe: slow refill.	Percs slowly---	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
499G: Nordness-----	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, percs slowly, depth to rock.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
520: Coppock-----	Moderate: seepage.	Severe: hard to pack, wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness-----	Erodes easily, wetness.	Wetness, erodes easily.

Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
520B: Coppock-----	Moderate: seepage, slope.	Severe: hard to pack, wetness.	Moderate: slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
570C2: Nira-----	Moderate: seepage, slope.	Moderate: hard to pack.	Moderate: deep to water, slow refill.	Deep to water	Slope-----	Erodes easily	Erodes easily.
571C2: Hedrick-----	Moderate: seepage, slope.	Moderate: hard to pack.	Moderate: deep to water, slow refill.	Deep to water	Slope-----	Erodes easily	Erodes easily.
572C2: Inton-----	Moderate: seepage, slope.	Moderate: hard to pack.	Moderate: deep to water, slow refill.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
572D2: Inton-----	Severe: slope.	Moderate: hard to pack.	Moderate: deep to water, slow refill.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
587: Chequest-----	Slight-----	Severe: wetness.	Severe: slow refill.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
594D2: Galland-----	Severe: seepage, slope.	Moderate: thin layer, hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
729: Nodaway-----	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Flooding-----	Erodes easily	Erodes easily.
Coppock-----	Moderate: seepage.	Severe: hard to pack, wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness-----	Erodes easily, wetness.	Wetness, erodes easily.
730B: Nodaway-----	Moderate: seepage, slope.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Slope, flooding.	Erodes easily	Erodes easily.

Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
730B: Coppock-----	Moderate: seepage, slope.	Severe: hard to pack, wetness.	Moderate: slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Cantril-----	Moderate: seepage, slope.	Moderate: wetness.	Moderate: deep to water, slow refill.	Frost action, slope.	Slope, wetness, rooting depth.	Wetness-----	Rooting depth.
779: Kalona-----	Slight-----	Severe: wetness.	Severe: slow refill.	Frost action--	Wetness-----	Erodes easily, wetness.	Wetness, erodes easily.
792C2: Armstrong-----	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
792D2: Armstrong-----	Severe: slope.	Severe: hard to pack.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, wetness, percs slowly.	Wetness, slope, percs slowly.
795C2: Ashgrove-----	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Wetness, erodes easily.
795D2: Ashgrove-----	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
822D2: Lamoni-----	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
831B, 831C2: Pershing-----	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.
832B, 832C2: Weller-----	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Erodes easily, percs slowly.

Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
832D2: Weller-----	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Perchs slowly, frost action, slope.	Slope, wetness, perchs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily, perchs slowly.
876B, 876C2: Ladoga-----	Moderate: seepage, slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope-----	Erodes easily	Erodes easily.
880B, 880C2: Clinton-----	Moderate: seepage, slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
880D2: Clinton-----	Severe: slope.	Moderate: hard to pack.	Severe: slow refill.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
977: Richwood-----	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Favorable-----	Erodes easily	Erodes easily.
993D2, 993E2: Gara-----	Severe: slope.	Slight-----	Severe: no water.	Deep to water	Slope, rooting depth.	Slope-----	Slope, rooting depth.
Armstrong-----	Severe: slope.	Severe: hard to pack.	Severe: no water.	Perchs slowly, frost action, slope.	Slope, wetness, perchs slowly.	Slope, wetness, perchs slowly.	Wetness, slope, perchs slowly.
994D2, 994E2: Galland-----	Severe: seepage, slope.	Moderate: thin layer, hard to pack, wetness.	Severe: no water.	Perchs slowly, frost action, slope.	Slope, wetness, perchs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
Douds-----	Severe: seepage, slope.	Severe: piping.	Severe: cutbanks cave	Deep to water	Slope, rooting depth.	Slope, too sandy	Slope, rooting depth.
1075B: Givin-----	Moderate: slope.	Moderate: hard to pack, wetness.	Severe: slow refill.	Frost action, slope.	Slope, wetness.	Erodes easily, wetness.	Erodes easily.

Water Management--Continued

Map symbol and soil name	Limitations for--			Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Irrigation	Terraces and diversions	Grassed waterways
1130: Belinda-----	Slight-----	Severe: wetness.	Severe: slow refill.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
1260: Beckwith-----	Slight-----	Severe: ponding.	Severe: no water.	Ponding, percs slowly.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
1715: Nodaway-----	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Flooding-----	Erodes easily	Erodes easily.
Vesser-----	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Ackmore-----	Moderate: seepage.	Severe: wetness.	Moderate: slow refill.	Flooding, frost action.	Wetness, flooding.	Wetness-----	Wetness.
5020: Pits and Dumps--	Severe: depth to rock, slope.	Slight-----	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
5030: Pits-----	Severe: depth to rock, slope.	Slight-----	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.	Slope, depth to rock.
5040: Orthents-----	Moderate: seepage, slope.	Slight-----	Severe: no water.	Deep to water	Slope, droughty.	Soil blowing---	Droughty.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features listed in tables are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

The table "Engineering Index Properties" gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 3). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt,

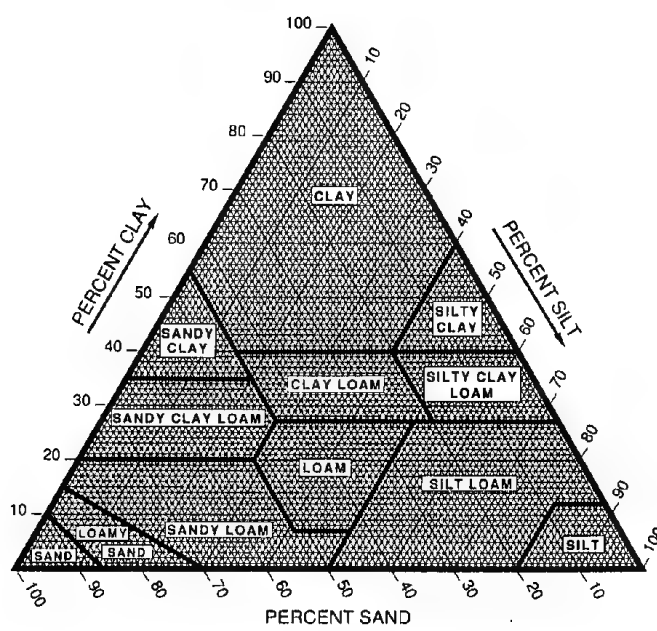


Figure 3.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches in diameter and 3 to 10 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

The tables "Physical Properties of the Soils" and "Chemical Properties of the Soils" show estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates

are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given in the series descriptions in Part I of this survey.

Clay as a soil separate, or component, consists of mineral soil particles that are less than 0.002 millimeter in diameter. The estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (oven-dry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at $\frac{1}{3}$ -bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In the table "Physical Properties of the Soils," the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk

density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, more than 9 percent, is sometimes used.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In the table "Physical Properties of the Soils," the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (as much as 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion.

Erosion factor K_f indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils generally are not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

- 4L. Calcareous loams, silt loams, clay loams, and silty clay loams that have more than 5 percent finely divided calcium carbonate. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if measures to control wind erosion are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils have less than 5 percent finely divided calcium carbonate. They are moderately erodible. Crops can be grown if ordinary measures to control wind erosion are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils have less than 5 percent finely divided

calcium carbonate. They are very slightly erodible. Crops can be grown if ordinary measures to control wind erosion are used.

8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

In the table "Chemical Properties of the Soils," *cation-exchange capacity* is the total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. It is a measurement of the nutrient-holding capacity of the soil.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate is expressed as a weighted percentage of the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients, such as phosphorus, is affected by the amount of carbonates in the soil.

Water Features

The table "Water Features" gives estimates of several important water features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Hydrologic soil groups are groups of soils that, when saturated, have the same runoff potential under similar storm and ground cover conditions. The soil properties that affect the runoff potential are those that influence the minimum rate of infiltration in a bare soil after prolonged wetting and when the soil is not frozen. These properties include the depth to a seasonal high water table, the intake rate, permeability after prolonged wetting, and the depth to a very slowly permeable layer. The influences of ground cover and slope are treated independently and are not taken into account in hydrologic soil groups.

In the definitions of the hydrologic soil groups, the infiltration rate is the rate at which water enters the soil at the surface and is controlled by surface conditions. The transmission rate is the rate at which water moves through the soil and is controlled by properties of the soil layers.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist chiefly of very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have a moderately fine to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils that have a moderately fine or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clayey soils that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in the table, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams or by runoff from adjacent slopes (fig. 4). Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered flooding. Standing water in marshes and swamps or in closed depressions is considered to be ponding.

The table "Water Features" gives the frequency and duration of flooding and the time of year when flooding is most likely to occur. Frequency, duration, and probable dates of occurrence are estimated. Frequency generally is expressed as none, rare, occasional, or frequent. *None* means flooding is not probable; *rare* that it is unlikely but is possible under unusual weather conditions (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year).

Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 to 30 days), and *very long* (more than 30 days). The time of year that



Figure 4.—Because the soil is occasionally flooded, camping is limited in this area of Nodaway silt loam, 0 to 2 percent slopes, along the Skunk River.

flooding is most likely to occur is expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered are local information about the extent and level of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is a zone of saturation at the highest average depth during the wettest season. It is at least 6 inches thick, persists in the soil for more than a few weeks, and is within 6 feet of the surface. Indicated in the table "Water Features" are the depth to the seasonal high water table, the kind of water table, and the months of the year when the water table usually is highest.

An *apparent* water table is indicated by the level at which water stands in a freshly dug, unlined borehole after adequate time for adjustments in the surrounding soil.

A *perched* water table is one that is above an unsaturated zone in the soil. The basis for determining that a water table is perched may be

general knowledge of the area. The water table is proven to be perched if the water level in a borehole is observed to fall when the borehole is extended.

Two numbers in the column showing depth to the water table indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. "More than 6.0" indicates that the water table is below a depth of 6 feet or that it is within a depth of 6 feet for less than a month.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation.

Soil Features

The table "Soil Features" gives estimates of several important soil features used in land use planning that involves engineering considerations. These features are described in the following paragraphs.

Depth to bedrock is given if bedrock is within a depth of 60 inches. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not

artificially drained. Silty and highly structured, clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

A *low* potential for frost action indicates that the soil is rarely susceptible to the formation of ice lenses; a *moderate* potential indicates that the soil is susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength; and a *high* potential indicates that the soil is highly susceptible to formation of ice lenses, resulting in frost heave and the subsequent loss of soil strength.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate content, texture, moisture content, and acidity of the soil.

Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Engineering Index Properties

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
13B:												
Olmitz-----	0-8	Loam-----	CL	A-6	0	0	100	90-100	85-95	60-80	30-40	11-20
	8-25	Loam, clay loam	CL	A-6	0	0	100	90-100	85-95	60-80	30-40	11-20
	25-60	Clay loam-----	CL	A-6, A-7	0	0	100	90-100	85-95	60-80	35-45	15-25
Vesser-----	0-10	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	10-25	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	25-60	Silty clay loam	CL	A-7	0	0	100	100	98-100	95-100	40-50	15-25
Zook-----	0-18	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	45-65	20-35
	18-60	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-55
23C2:												
Arispe-----	0-8	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	8-13	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-60	25-35
	13-52	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	52-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	20-30
24D2:												
Shelby-----	0-8	Clay loam-----	CL	A-6, A-7	0	0	90-95	85-95	75-90	55-70	35-45	15-25
	8-16	Clay loam-----	CL	A-6, A-7	0	0	90-95	85-95	75-90	55-70	35-45	15-25
	16-45	Clay loam-----	CL	A-6, A-7	0	0-5	90-95	85-95	75-90	55-70	30-45	15-25
	45-60	Clay loam-----	CL	A-6, A-7	0	0-5	90-95	85-95	75-90	55-70	30-45	15-25
41B:												
Sparta-----	0-20	Loamy fine sand	SM	A-2, A-4	0	0	85-100	85-100	50-95	15-50	0-14	NP
	20-30	Loamy fine sand, fine sand, sand.	SP-SM, SM	A-2, A-3, A-4	0	0	85-100	85-100	50-95	5-50	0-14	NP
	30-60	Sand, fine sand	SP-SM, SM, SP	A-2, A-3	0	0	85-100	85-100	50-95	2-30	0-14	NP
51:												
Vesser-----	0-10	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	10-25	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	25-60	Silty clay loam	CL	A-7	0	0	100	100	98-100	95-100	40-50	15-25
51B:												
Vesser-----	0-10	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	10-25	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	25-60	Silty clay loam	CL	A-7	0	0	100	100	98-100	95-100	40-50	15-25

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
54:												
Zook-----	0-18	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	45-65	20-35
	18-53	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-55
	53-60	Silty clay loam, silty clay, silt loam.	CH, CL, ML, MH	A-7, A-6	0	0	100	100	95-100	95-100	35-80	10-50
65D2:												
Lindley-----	0-9	Loam-----	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	9-43	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	43-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
65E:												
Lindley-----	0-10	Loam-----	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	10-50	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	50-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
65E2:												
Lindley-----	0-8	Loam-----	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	8-42	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	42-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
65F2:												
Lindley-----	0-7	Loam-----	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	7-41	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	41-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
65G:												
Lindley-----	0-10	Loam-----	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	10-48	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	48-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
74:												
Rubio-----	0-8	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	8-16	Silt loam-----	CL-ML, CL, ML	A-4	0	0	100	100	100	95-100	25-35	5-10
	16-47	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	100	95-100	55-70	30-40
	47-60	Silty clay loam	CH, CL	A-7	0	0	100	100	100	95-100	45-55	20-30
75:												
Givin-----	0-14	Silt loam-----	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	14-41	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	45-60	25-35
	41-60	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-50	20-30

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
75B:												
Givin-----	0-10	Silt loam-----	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	10-37	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	45-60	25-35
	37-60	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-50	20-30
76B:												
Ladoga-----	0-13	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	13-45	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	45-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-20
76C2:												
Ladoga-----	0-11	Silty clay loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	11-43	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	43-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-20
76D2:												
Ladoga-----	0-10	Silty clay loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	10-40	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	40-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-20
80B:												
Clinton-----	0-10	Silt loam-----	ML	A-4	0	0	100	100	100	95-100	30-40	5-10
	10-32	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	32-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
80C2:												
Clinton-----	0-9	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	9-27	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	27-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
80D2:												
Clinton-----	0-8	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	8-26	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	26-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
87B:												
Colo-----	0-22	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-60	15-30
	22-52	Silty clay loam	CL, CH	A-7	0	0	100	100	90-100	90-100	40-55	20-30
	52-60	Silty clay loam, clay loam, silt loam.	CL, CH	A-7	0	0	100	100	95-100	80-100	40-55	15-30
Zook-----	0-18	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	95-100	45-65	20-35
	18-60	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	95-100	95-100	60-85	35-55
122:												
Sperry-----	0-10	Silt loam-----	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	10-18	Silt loam-----	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	18-35	Silty clay loam, silty clay.	CH	A-7	0	0	100	100	100	95-100	50-65	25-35
	35-60	Silty clay loam, silt loam.	CL	A-7	0	0	100	100	100	95-100	40-50	20-30
130:												
Belinda-----	0-7	Silt loam-----	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	7-12	Silt loam-----	CL-ML, CL, ML	A-4	0	0	100	100	100	95-100	25-35	5-10
	12-41	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	41-60	Silty clay loam	CH	A-7	0	0	100	100	100	95-100	50-65	25-35

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
131B:												
Pershing-----	0-15	Silt loam-----	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	15-20	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	20-54	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	40-65	20-40
	54-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	35-55	20-35
131B2:												
Pershing-----	0-9	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	9-13	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	13-48	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	40-65	20-40
	48-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	35-55	20-35
131C2:												
Pershing-----	0-9	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	9-12	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	12-44	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	40-65	20-40
	44-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	35-55	20-35
132B:												
Weller-----	0-11	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	11-37	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	37-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30
132C:												
Weller-----	0-10	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	10-36	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	36-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
132C2: Weller-----	0-8	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	8-32	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	32-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30
132D: Weller-----	0-9	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	9-35	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	35-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30
132D2: Weller-----	0-7	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	7-31	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	31-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30
139: Perks-----	0-9	Loamy sand-----	SM, SP, SP-SM	A-1	0	0	90-100	90-95	30-50	3-20	0-14	NP
	9-60	Sand, loamy sand.	SM, SP, SP-SM	A-1	0	0	90-100	90-95	30-50	3-20	0-14	NP
179D2: Gara-----	0-7	Clay loam-----	CL	A-6, A-7	0	0	90-95	85-95	70-85	55-75	35-45	15-25
	7-47	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	47-60	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
179E2: Gara-----	0-6	Clay loam-----	CL	A-6, A-7	0	0	90-95	85-95	70-85	55-75	35-45	15-25
	6-46	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	46-60	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
180: Keomah-----	0-14	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	14-47	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	100	95-100	45-60	30-45
	47-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	15-30
180B: Keomah-----	0-12	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	12-45	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	100	95-100	45-60	30-45
	45-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	15-30
208: Klum-----	0-20	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	95-100	70-90	40-55	20-35	3-10
	20-60	Stratified silt loam to sandy loam.	CL-ML, SP-SM, SC-SM	A-4, A-2	0	0	100	95-100	70-95	10-70	15-30	NP-10
211: Edina-----	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	85-100	25-40	5-15
	9-16	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	95-100	85-100	25-40	5-15
	16-47	Silty clay, clay.	CH	A-7	0	0	100	100	95-100	90-100	55-75	30-45
	47-60	Silty clay loam	CL, CH	A-6, A-7	0	0	100	100	95-100	90-100	35-60	15-35
220: Nodaway-----	0-7	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-35	5-15
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-40	5-15
222C: Clarinda-----	0-12	Silty clay loam	CL	A-7	0	0	100	95-100	90-100	85-100	40-50	20-30
	12-21	Silty clay, clay.	CH	A-7	0	0	100	95-100	85-100	80-100	55-70	30-40
	21-60	Clay, silty clay.	CH	A-7	0	0	95-100	95-100	80-95	75-90	55-70	35-45

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
222C2:												
Clarinda-----	0-9	Silty clay loam	CL	A-7	0	0	100	95-100	90-100	85-100	40-50	20-30
	9-19	Silty clay, clay.	CH	A-7	0	0	100	95-100	85-100	80-100	55-70	30-40
	19-60	Clay, silty clay.	CH	A-7	0	0	95-100	95-100	80-95	75-90	55-70	35-45
223C2:												
Rinda-----	0-8	Silty clay loam	CL	A-7	0	0	100	95-100	90-100	85-100	40-50	20-30
	8-60	Clay, silty clay.	CH, CL	A-7	0	0	95-100	95-100	80-95	75-90	55-70	35-45
260:												
Beckwith-----	0-5	Silt loam-----	CL, ML, CL-ML	A-4	0	0	100	100	100	95-100	25-35	5-10
	5-15	Silt loam-----	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	15-31	Silty clay-----	CH	A-7	0	0	100	100	100	95-100	55-70	30-40
	31-60	Silty clay loam	CH	A-7	0	0	100	100	100	95-100	50-65	25-35
263:												
Okaw-----	0-17	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	90-100	25-40	5-15
	17-40	Silty clay, clay, silty clay loam.	CH	A-7	0	0	100	95-100	95-100	85-100	50-70	30-50
	40-55	Silty clay loam, silty clay, clay.	CH, CL	A-7	0	0	100	100	95-100	80-100	45-65	20-40
	55-60	Silty clay loam, silty clay, clay.	CH, CL	A-7	0	0	100	100	95-100	80-100	45-65	20-35
264B:												
Ainsworth-----	0-8	Silt loam-----	ML	A-4	0	0	100	100	100	90-95	30-40	5-10
	8-42	Silty clay loam	CL, CH	A-7	0	0	100	100	95-100	80-95	40-55	20-35
	42-60	Sandy loam, loamy sand, sand.	SP-SM, SM	A-2, A-3	0	0	95-100	90-100	60-85	5-35	15-20	NP
273B:												
Olmitz-----	0-8	Loam-----	CL	A-6	0	0	100	90-100	85-95	60-80	30-40	11-20
	8-25	Loam, clay loam	CL	A-6	0	0	100	90-100	85-95	60-80	30-40	11-20
	25-60	Clay loam-----	CL	A-6, A-7	0	0	100	90-100	85-95	60-80	35-45	15-25

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
279:												
Taintor-----	0-8	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	45-60	20-30
	8-22	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	45-60	20-30
	22-46	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	100	95-100	50-65	25-35
	46-60	Silty clay loam, silt loam.	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
280:												
Mahaska-----	0-20	Silty clay loam	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	15-25
	20-55	Silty clay loam, silty clay.	CH, MH	A-7	0	0	100	100	100	95-100	50-60	20-30
	55-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-20
280B:												
Mahaska-----	0-20	Silty clay loam	CL	A-7, A-6	0	0	100	100	100	95-100	35-50	15-25
	20-49	Silty clay loam, silty clay.	CH, MH	A-7	0	0	100	100	100	95-100	50-60	20-30
	49-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	15-20
281B:												
Otley-----	0-18	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	18-41	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	41-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	20-30
281B2:												
Otley-----	0-9	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	9-28	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	28-36	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	36-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	20-30

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
281C:												
Otley-----	0-15	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	15-38	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	38-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	20-30
281C2:												
Otley-----	0-8	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	8-26	Silty clay loam	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
	26-34	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	34-60	Silty clay loam, silt loam.	CL	A-7, A-6	0	0	100	100	100	95-100	35-45	20-30
293C:												
Chelsea-----	0-5	Loamy fine sand	SM, SP-SM	A-2-4	0	0	100	100	65-95	10-35	0-14	NP
	5-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	100	65-95	3-15	0-14	NP
Fayette-----	0-10	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	10-57	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	57-60	Silt loam-----	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
293F:												
Chelsea-----	0-5	Loamy fine sand	SM, SP-SM	A-2-4	0	0	100	100	65-95	10-35	0-14	NP
	5-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	0	100	100	65-95	3-15	0-14	NP
Fayette-----	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	0	100	100	100	95-100	25-35	5-15
	8-55	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	55-60	Silt loam-----	CL	A-6	0	0	100	100	100	95-100	30-40	10-20

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
313E2: Gosport-----	0-8	Silty clay loam	ML, MH	A-7	0	0	100	90-100	90-100	85-100	41-55	11-20
	8-22	Clay, silty clay, silty clay loam.	CH	A-7	0	0	100	90-100	90-100	85-100	50-65	35-50
	22-60	Weathered bedrock.	---	---	0	0	0	0	0	0	---	NP
313G: Gosport-----	0-6	Silty clay loam	ML, MH	A-7	0	0	100	90-100	90-100	85-100	41-55	11-20
	6-18	Clay, silty clay, silty clay loam.	CH	A-7	0	0	100	90-100	90-100	85-100	50-65	35-50
	18-60	Weathered bedrock.	---	---	0	0	0	0	0	0	---	NP
315: Nodaway-----	0-7	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-35	5-15
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-40	5-15
Klum-----	0-20	Fine sandy loam	CL-ML, SC-SM	A-4	0	0	100	95-100	70-90	40-55	20-35	3-10
	20-60	Stratified silt loam to sandy loam.	CL-ML, SP-SM, SC-SM	A-4, A-2	0	0	100	95-100	70-95	10-70	15-30	NP-10
Perks-----	0-9	Sand-----	SM, SP, SP-SM	A-1	0	0	90-100	90-95	30-50	3-20	0-14	NP
	9-60	Sand, loamy sand.	SM, SP, SP-SM	A-1	0	0	90-100	90-95	30-50	3-20	0-14	NP
362: Haig-----	0-12	Silt loam-----	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	12-22	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	22-42	Silty clay-----	CH	A-7	0	0	100	100	100	95-100	50-65	30-40
	42-60	Silty clay loam	CL, CH	A-7, A-6	0	0	100	100	100	95-100	35-55	20-30
363: Haig-----	0-12	Silty clay loam	CL, CH, ML, MH	A-7	0	0	100	100	100	95-100	40-55	15-25
	12-22	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	22-42	Silty clay-----	CH	A-7	0	0	100	100	100	95-100	50-65	30-40
	42-60	Silty clay loam	CL, CH	A-7, A-6	0	0	100	100	100	95-100	35-55	20-30

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
364B:												
Grundy-----	0-15	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	90-100	40-55	20-35
	15-19	Silty clay	CH, CL	A-7	0	0	100	100	95-100	90-100	45-55	25-35
	19-42	Silty clay-----	CH	A-7	0	0	100	100	95-100	90-100	50-70	30-45
	42-60	Silty clay loam	CH, CL	A-7	0	0	100	100	90-100	90-100	40-55	25-35
364B2:												
Grundy-----	0-10	Silty clay loam	CH, CL	A-7	0	0	100	100	95-100	90-100	40-55	20-35
	10-15	Silty clay	CH, CL	A-7	0	0	100	100	95-100	90-100	45-55	25-35
	15-38	Silty clay-----	CH	A-7	0	0	100	100	95-100	90-100	50-70	30-45
	38-60	Silty clay loam	CH, CL	A-7	0	0	100	100	90-100	90-100	40-55	25-35
423D2:												
Bucknell-----	0-6	Silty clay loam	CL	A-6, A-7	0	0	95-100	95-100	80-95	70-95	35-45	15-25
	6-50	Clay, clay loam	CH	A-7	0	0	95-100	95-100	90-100	85-100	50-60	25-35
	50-60	Clay loam-----	CL	A-6, A-7	0	0	95-100	95-100	70-90	55-85	35-50	15-30
424D2:												
Lindley-----	0-9	Loam-----	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	9-43	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	43-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
Keswick-----	0-10	Loam-----	CL, CL-ML	A-6, A-4	0	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	10-29	Clay loam, clay	CH, CL	A-7	0	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	29-60	Clay loam-----	CL	A-6	0	0-5	90-100	80-100	70-90	55-80	30-40	15-25
424E2:												
Lindley-----	0-8	Loam-----	CL	A-6	0	0	95-100	90-100	85-95	50-65	25-35	10-15
	8-42	Clay loam, loam	CL	A-6, A-7	0	0	95-100	90-100	85-95	55-75	30-45	12-20
	42-60	Loam, clay loam	CL	A-6	0	0	95-100	90-100	85-95	50-70	25-35	10-15
Keswick-----	0-9	Loam-----	CL, CL-ML	A-6, A-4	0	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	9-27	Clay loam, clay	CH, CL	A-7	0	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	27-60	Clay loam-----	CL	A-6	0	0-5	90-100	80-100	70-90	55-80	30-40	15-25
425D:												
Keswick-----	0-12	Loam-----	CL, CL-ML	A-6, A-4	0	0-5	90-100	80-100	75-90	60-80	20-30	5-15
	12-31	Clay loam, clay	CH, CL	A-7	0	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	31-60	Clay loam-----	CL	A-6	0	0-5	90-100	80-100	70-90	55-80	30-40	15-25
425D2:												
Keswick-----	0-10	Clay loam-----	CL	A-6, A-4	0	0-5	90-100	80-100	75-90	60-80	35-50	15-25
	10-29	Clay loam, clay	CH, CL	A-7	0	0-5	90-100	80-100	70-90	55-80	40-70	20-40
	29-60	Clay loam-----	CL	A-6	0	0-5	90-100	80-100	70-90	55-80	30-40	15-25

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
430:												
Ackmore-----	0-8	Silt loam-----	CL, ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	25-50	8-20
	8-27	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	25-50	8-20
	27-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	95-100	85-100	35-60	15-30
453:												
Tuskeego-----	0-14	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	100	95-100	95-100	25-35	5-15
	14-46	Silt loam, silty clay loam.	CL	A-6	0	0	100	100	95-100	95-100	30-35	11-15
	46-60	Silty clay loam, silty clay.	CH	A-7	0	0	100	100	95-100	95-100	50-60	25-35
499G:												
Nordness-----	0-4	Silt loam-----	CL, CL-ML	A-4	0	0	100	100	90-100	70-90	20-30	5-10
	4-11	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	0	100	100	90-100	70-90	30-45	15-25
	11-17	Silty clay loam, clay loam, loam.	CL	A-7, A-6	0	2-10	85-95	80-90	70-85	65-85	30-45	15-25
	17-60	Unweathered bedrock, weathered bedrock.	---	---	0	0	0	0	0	0	---	NP
520:												
Coppock-----	0-9	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	9-29	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	29-53	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	0	100	100	98-100	95-100	35-55	15-25
	53-60	Silty clay loam	CL, CH	A-7	0	0	100	100	98-100	95-100	40-60	15-30
520B:												
Coppock-----	0-9	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	9-29	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	29-53	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	0	100	100	98-100	95-100	35-55	15-25
	53-60	Silty clay loam	CL, CH	A-7	0	0	100	100	98-100	95-100	40-60	15-30

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	#	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
570C2: Nira-----	0-11	Silty clay loam	CL, CH, ML, MH	A-7	0	0	100	100	100	95-100	40-55	15-25
	11-39	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	39-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
571C2: Hedrick-----	0-7	Silty clay loam	CL	A-6, A-4	0	0	100	100	100	95-100	35-45	15-25
	7-56	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	56-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-20
572C2: Inton-----	0-7	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	7-48	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	48-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-25
572D2: Inton-----	0-5	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	5-46	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	46-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-25
587: Chequest-----	0-17	Silty clay loam	CL	A-7	0	0	100	100	95-100	95-100	40-50	15-25
	17-60	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	95-100	90-100	45-60	20-30
594D2: Galland-----	0-7	Clay loam-----	CL	A-6, A-7	0	0	90-100	80-100	75-100	65-90	30-45	10-20
	7-54	Clay loam, clay, silty clay.	CL, CH	A-7	0	0-5	90-100	80-100	75-100	65-80	40-55	25-35
	54-60	Stratified sandy loam to clay.	SC-SM, SC, CL-ML, CL	A-4, A-2, A-6	0	0-5	90-100	80-100	65-95	30-60	20-35	5-15

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200		
	In				Pct	Pct					Pct	
729:												
Nodaway-----	0-7	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-35	5-15
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-40	5-15
Coppock-----	0-9	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	9-29	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	29-53	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	0	100	100	98-100	95-100	35-55	15-25
	53-60	Silty clay loam	CL, CH	A-7	0	0	100	100	98-100	95-100	40-60	15-30
730B:												
Nodaway-----	0-7	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-35	5-15
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-40	5-15
Coppock-----	0-9	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	9-29	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	29-53	Silty clay loam, silt loam.	CL, CH, ML, MH	A-6, A-7	0	0	100	100	98-100	95-100	35-55	15-25
	53-60	Silty clay loam	CL, CH	A-7	0	0	100	100	98-100	95-100	40-60	15-30
Cantril-----	0-13	Silt loam-----	CL	A-6	0	0	100	100	85-95	65-75	30-40	11-20
	13-60	Clay loam-----	CL	A-6, A-7	0	0	100	100	90-100	70-88	35-45	15-25
779:												
Kalona-----	0-20	Silty clay loam	MH	A-7	0	0	100	100	100	95-100	50-65	20-30
	20-41	Silty clay loam, silty clay.	CH	A-7	0	0	100	100	100	95-100	50-65	25-35
	41-60	Silty clay loam, silt loam.	CL	A-7	0	0	100	100	100	95-100	40-50	15-25
792C2:												
Armstrong-----	0-7	Clay loam-----	CL	A-6, A-7	0	0-5	90-100	80-95	75-90	55-80	35-45	15-25
	7-60	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0	0-5	90-100	80-95	70-90	55-80	45-70	20-35
792D2:												
Armstrong-----	0-6	Clay loam-----	CL	A-6, A-7	0	0-5	90-100	80-95	75-90	55-80	35-45	15-25
	6-60	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0	0-5	90-100	80-95	70-90	55-80	45-70	20-35

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
795C2:												
Ashgrove-----	0-9	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-100	35-45	15-25
	9-18	Silty clay, silty clay loam.	CH	A-7	0	0	100	95-100	85-100	85-100	55-70	30-40
	18-60	Clay, silty clay.	CH	A-7	0	0	95-100	95-100	75-90	75-90	50-60	25-35
795D2:												
Ashgrove-----	0-7	Silty clay loam	CL	A-6, A-7	0	0	100	95-100	90-100	85-100	35-45	15-25
	7-16	Silty clay, silty clay loam.	CH	A-7	0	0	100	95-100	85-100	85-100	55-70	30-40
	16-60	Clay, silty clay.	CH	A-7	0	0	95-100	95-100	75-90	75-90	50-60	25-35
822D2:												
Lamoni-----	0-12	Silty clay loam	CL	A-6, A-7	0	0	95-100	95-100	80-95	70-95	35-45	15-25
	12-52	Clay loam, clay	CH	A-7	0	0	95-100	95-100	90-100	85-100	50-60	25-35
	52-60	Clay loam-----	CL	A-6, A-7	0	0	95-100	95-100	70-90	55-85	35-50	15-30
831B:												
Pershing-----	0-15	Silt loam-----	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	15-20	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	20-54	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	40-65	20-40
	54-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	35-55	20-35
831C2:												
Pershing-----	0-9	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	9-12	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	15-30
	12-44	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	40-65	20-40
	44-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	35-55	20-35
832B:												
Weller-----	0-11	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	11-37	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	37-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10 inches	3-10 inches	#	10	40	200		
	In				Pct	Pct					Pct	
832C2: Weller-----	0-8	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	8-32	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	32-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30
832D2: Weller-----	0-7	Silty clay loam	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	7-31	Silty clay loam, silty clay.	CH, CL	A-7	0	0	100	100	100	95-100	45-65	30-40
	31-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	100	95-100	30-55	10-30
876B: Ladoga-----	0-13	Silt loam-----	CL, CL-ML	A-6, A-4	0	0	100	100	100	95-100	25-40	5-15
	13-45	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	45-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-20
876C2: Ladoga-----	0-11	Silty clay loam	CL	A-6	0	0	100	100	100	95-100	30-40	10-20
	11-43	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	43-60	Silty clay loam, silt loam.	CL	A-6	0	0	100	100	100	95-100	30-40	15-20
880B: Clinton-----	0-10	Silt loam-----	ML	A-4	0	0	100	100	100	95-100	30-40	5-10
	10-32	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	32-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10						
					inches	inches	4	10	40	200		
	In				Pct	Pct					Pct	
880C2:												
Clinton-----	0-9	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	9-27	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	27-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
880D2:												
Clinton-----	0-8	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
	8-26	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	40-55	25-35
	26-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	0	100	100	100	95-100	35-45	15-25
977:												
Richwood-----	0-15	Silt loam-----	CL, ML	A-4, A-6	0	0	100	100	90-100	85-95	25-35	8-13
	15-60	Silt loam, silty clay loam.	CL	A-4, A-6	0	0	100	100	90-100	85-95	25-40	7-20
993D2:												
Gara-----	0-7	Loam-----	CL	A-6, A-7	0	0	90-95	85-95	70-85	55-75	35-45	15-25
	7-47	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	47-60	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
Armstrong-----	0-6	Loam-----	CL, CL-ML	A-6, A-4	0	0-5	90-100	80-95	75-90	55-80	20-30	5-15
	6-60	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0	0-5	90-100	80-95	70-90	55-80	45-70	20-35
993E2:												
Gara-----	0-6	Loam-----	CL	A-6, A-7	0	0	90-95	85-95	70-85	55-75	35-45	15-25
	6-46	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
	46-60	Clay loam, loam	CL	A-6	0	0-5	90-95	85-95	70-85	55-75	30-40	15-25
Armstrong-----	0-5	Loam-----	CL, CL-ML	A-6, A-4	0	0-5	90-100	80-95	75-90	55-80	20-30	5-15
	5-60	Clay loam, clay, silty clay loam.	CL, CH, ML, MH	A-7	0	0-5	90-100	80-95	70-90	55-80	45-70	20-35

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	#	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
994D2:												
Galland-----	0-7	Loam-----	CL	A-6	0	0	90-100	80-100	75-100	65-90	30-40	10-20
	7-54	Clay loam, clay, silty clay.	CL, CH	A-7	0	0-5	90-100	80-100	75-100	65-80	40-55	25-35
	54-60	Stratified sandy loam to clay.	SC-SM, SC, CL-ML, CL	A-4, A-2, A-6	0	0-5	90-100	80-100	65-95	30-60	20-35	5-15
Douds-----	0-8	Loam-----	CL	A-6	0	0	95-100	85-100	70-90	60-80	25-35	10-20
	8-33	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7	0	0	90-100	85-100	70-80	35-60	30-45	15-25
	33-60	Stratified loamy sand to clay loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-2	0	0	90-100	85-100	65-85	20-60	15-35	5-15
994E2:												
Galland-----	0-8	Loam-----	CL	A-6	0	0	90-100	80-100	75-100	65-90	30-40	10-20
	8-55	Clay loam, clay, silty clay.	CL, CH	A-7	0	0-5	90-100	80-100	75-100	65-80	40-55	25-35
	55-60	Stratified sandy loam to clay.	SC-SM, SC, CL-ML, CL	A-4, A-2, A-6	0	0-5	90-100	80-100	65-95	30-60	20-35	5-15
Douds-----	0-12	Loam-----	CL	A-6	0	0	95-100	85-100	70-90	60-80	25-35	10-20
	12-37	Clay loam, loam, sandy clay loam.	CL, SC	A-6, A-7	0	0	90-100	85-100	70-80	35-60	30-45	15-25
	37-60	Stratified loamy sand to clay loam.	SC, CL, SC-SM, CL-ML	A-4, A-6, A-2	0	0	90-100	85-100	65-85	20-60	15-35	5-15
1075B:												
Givin-----	0-10	Silt loam-----	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	10-37	Silty clay loam, silty clay.	CL, CH	A-7	0	0	100	100	100	95-100	45-60	25-35
	37-60	Silty clay loam	CL	A-6, A-7	0	0	100	100	100	95-100	35-50	20-30
1130:												
Belinda-----	0-7	Silt loam-----	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	7-12	Silt loam-----	CL-ML, CL, ML	A-4	0	0	100	100	100	95-100	25-35	5-10
	12-41	Silty clay, silty clay loam.	CH	A-7	0	0	100	100	100	95-100	40-55	20-30
	41-60	Silty clay loam	CH	A-7	0	0	100	100	100	95-100	50-65	25-35

Engineering Index Properties--Continued

Map symbol and soil name	Depth	USDA texture	Classification		Fragments		Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO	>10	3-10	4	10	40	200		
					inches	inches						
	In				Pct	Pct					Pct	
1260:												
Beckwith-----	0-5	Silt loam-----	CL, ML, CL-ML	A-4	0	0	100	100	100	95-100	25-35	5-10
	5-15	Silt loam-----	CL, ML	A-4, A-6	0	0	100	100	100	95-100	30-40	5-15
	15-31	Silty clay-----	CH	A-7	0	0	100	100	100	95-100	55-70	30-40
	31-60	Silty clay loam	CH	A-7	0	0	100	100	100	95-100	50-65	25-35
1715:												
Nodaway-----	0-7	Silt loam-----	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-35	5-15
	7-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	0	100	95-100	95-100	90-100	25-40	5-15
Vesser-----	0-10	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	10-25	Silt loam-----	CL	A-6	0	0	100	100	98-100	95-100	30-40	10-20
	25-60	Silty clay loam	CL	A-7	0	0	100	100	98-100	95-100	40-50	15-25
Ackmore-----	0-8	Silt loam-----	CL, ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	25-50	8-20
	8-27	Silt loam, silty clay loam.	CL, ML	A-4, A-6, A-7	0	0	100	100	95-100	85-100	25-50	8-20
	27-60	Silty clay loam, silt loam.	CH, CL	A-7, A-6	0	0	100	100	95-100	85-100	35-60	15-30
5020:												
Pits and Dumps--	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
5030:												
Pits-----	0-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---	---
5040:												
Orthents-----	0-60	Loam-----	---	---	0	0	0	0	0	0	---	NP-15
	60-80	Variable-----	---	---	0	0	0	0	0	0	---	NP

Physical Properties of the Soils

(Entries under "Erosion factors-T" apply to the entire profile. Entries under "Wind erodibility group" and "Wind erodibility index" apply only to the surface layer)

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
13B:												
Olmitz-----	0-8	24-27	1.40-1.45	0.60-2.00	0.19-0.21	Moderate	3.0-4.0	0.24	0.24	5	6	48
	8-25	24-30	1.40-1.45	0.60-2.00	0.19-0.21	Moderate	2.0-3.0	0.28	0.28			
	25-60	27-34	1.45-1.55	0.60-2.00	0.15-0.17	Moderate	1.0-2.0	0.28	0.28			
Vesser-----	0-10	20-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	2.0-3.0	0.28	0.28	5	6	48
	10-25	18-22	1.35-1.40	0.60-2.00	0.18-0.22	Moderate	1.0-2.0	0.43	0.43			
	25-60	30-35	1.40-1.45	0.60-2.00	0.17-0.21	Moderate	0.0-1.0	0.43	0.43			
Zook-----	0-18	35-40	1.30-1.35	0.20-0.60	0.21-0.23	High----	5.0-7.0	0.37	0.37	5	7	38
	18-60	36-45	1.30-1.45	0.06-0.20	0.11-0.13	High----	3.0-4.0	0.28	0.28			
23C2:												
Arispe-----	0-8	28-38	1.35-1.40	0.60-2.00	0.21-0.23	High----	2.2-3.2	0.37	0.37	3	7	38
	8-13	38-42	1.35-1.45	0.06-0.20	0.18-0.20	High----	0.5-1.0	0.43	0.43			
	13-52	30-38	1.35-1.45	0.20-0.60	0.18-0.20	High----	0.0-0.5	0.43	0.43			
	52-60	24-35	1.40-1.50	0.60-2.00	0.18-0.20	High----	0.0-0.5	0.43	0.43			
24D2:												
Shelby-----	0-8	27-35	1.50-1.55	0.20-0.60	0.16-0.18	Moderate	2.2-3.2	0.32	0.32	5	6	48
	8-16	30-35	1.50-1.55	0.20-0.60	0.16-0.18	Moderate	1.0-2.0	0.28	0.28			
	16-45	30-35	1.55-1.65	0.20-0.60	0.16-0.18	Moderate	0.0-1.0	0.28	0.28			
	45-60	30-35	1.55-1.65	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.37	0.37			
41B:												
Sparta-----	0-20	3-10	1.20-1.40	2.00-6.00	0.09-0.12	Low-----	1.0-2.0	0.17	0.17	5	2	134
	20-30	1-8	1.40-1.60	6.00-20.00	0.05-0.11	Low-----	0.1-1.0	0.17	0.17			
	30-60	0-5	1.50-1.70	6.00-20.00	0.04-0.07	Low-----	0.0-0.5	0.17	0.17			
51:												
Vesser-----	0-10	20-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	10-25	18-22	1.35-1.40	0.60-2.00	0.18-0.22	Moderate	1.0-2.0	0.43	0.43			
	25-60	30-35	1.40-1.45	0.60-2.00	0.17-0.21	Moderate	0.0-1.0	0.43	0.43			
51B:												
Vesser-----	0-10	20-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	2.5-3.5	0.28	0.28	5	6	48
	10-25	18-22	1.35-1.40	0.60-2.00	0.18-0.22	Moderate	1.0-2.0	0.43	0.43			
	25-60	30-35	1.40-1.45	0.60-2.00	0.17-0.21	Moderate	0.0-1.0	0.43	0.43			
54:												
Zook-----	0-18	35-40	1.30-1.35	0.20-0.60	0.21-0.23	High----	5.0-7.0	0.37	0.37	5	7	38
	18-53	36-45	1.30-1.45	0.06-0.20	0.11-0.13	High----	2.0-4.0	0.28	0.28			
	53-60	20-45	1.30-1.45	0.06-0.60	0.11-0.22	High----	0.0-1.0	0.28	0.28			
65D2:												
Lindley-----	0-9	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low-----	1.5-2.5	0.32	0.32	5	6	48
	9-43	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	43-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			
65E:												
Lindley-----	0-10	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low-----	2.0-3.0	0.32	0.32	5	6	48
	10-50	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	50-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			
65E2:												
Lindley-----	0-8	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low-----	1.5-2.5	0.32	0.32	5	6	48
	8-42	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	42-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
65P2:												
Lindley-----	0-7	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low-----	1.5-2.5	0.32	0.32	5	6	48
	7-41	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	41-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			
65G:												
Lindley-----	0-10	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low-----	2.0-3.0	0.32	0.32	5	6	48
	10-48	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	48-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			
74:												
Rubio-----	0-8	16-22	1.35-1.40	0.60-2.00	0.22-0.24	Low-----	2.5-3.5	0.37	0.37	3	6	48
	8-16	16-22	1.40-1.45	0.60-2.00	0.20-0.22	Low-----	0.0-0.5	0.43	0.43			
	16-47	35-42	1.45-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	47-60	32-40	1.50-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
75:												
Givin-----	0-14	18-26	1.30-1.40	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.32	0.32	5	6	48
	14-41	36-42	1.30-1.45	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	41-60	27-34	1.40-1.50	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
75B:												
Givin-----	0-10	18-26	1.30-1.40	0.60-2.00	0.22-0.24	Moderate	2.5-3.5	0.32	0.32	5	6	48
	10-37	36-42	1.30-1.45	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	37-60	27-34	1.40-1.50	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
76B:												
Ladoga-----	0-13	18-27	1.30-1.35	0.60-2.00	0.22-0.24	Low-----	2.5-3.5	0.32	0.32	5	6	48
	13-45	36-42	1.30-1.40	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	45-60	24-32	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
76C2:												
Ladoga-----	0-11	27-35	1.30-1.35	0.60-2.00	0.22-0.24	Low-----	2.0-3.0	0.32	0.32	5	7	38
	11-43	36-42	1.30-1.40	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	43-60	24-32	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
76D2:												
Ladoga-----	0-10	27-35	1.30-1.35	0.60-2.00	0.22-0.24	Low-----	2.0-3.0	0.32	0.32	5	7	38
	10-40	36-42	1.30-1.40	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	40-60	24-32	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
80B:												
Clinton-----	0-10	16-26	1.30-1.40	0.60-2.00	0.20-0.22	Low-----	2.0-3.0	0.37	0.37	5	6	48
	10-32	36-42	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-1.0	0.37	0.37			
	32-60	24-35	1.40-1.55	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
80C2:												
Clinton-----	0-9	27-34	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.5-2.5	0.37	0.37	5	7	38
	9-27	36-42	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-0.5	0.37	0.37			
	27-60	24-35	1.40-1.55	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
80D2:												
Clinton-----	0-8	27-34	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.5-2.5	0.37	0.37	5	7	38
	8-26	36-42	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-0.5	0.37	0.37			
	26-60	24-35	1.40-1.55	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
87B:												
Cole-----	0-22	27-36	1.28-1.32	0.60-2.00	0.21-0.23	Moderate	5.0-7.0	0.28	0.28	5	7	38
	22-52	30-35	1.25-1.35	0.60-2.00	0.18-0.20	Moderate	3.0-4.0	0.28	0.28			
	52-60	25-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.32	0.32			
Zook-----	0-18	35-40	1.30-1.35	0.20-0.60	0.21-0.23	High-----	5.0-7.0	0.37	0.37	5	7	38
	18-60	36-45	1.30-1.45	0.06-0.20	0.11-0.13	High-----	3.0-4.0	0.28	0.28			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
122: Sperry-----	0-10	18-22	1.35-1.40	0.60-2.00	0.22-0.24	Moderate	3.0-4.0	0.37	0.37	3	6	48
	10-18	18-22	1.35-1.40	0.60-2.00	0.22-0.24	Moderate	0.5-1.0	0.43	0.43			
	18-35	38-45	1.40-1.45	0.06-0.20	0.14-0.16	High-----	0.5-2.0	0.43	0.43			
	35-60	26-34	1.45-1.50	0.20-0.60	0.19-0.21	High-----	0.0-1.0	0.43	0.43			
130: Belinda-----	0-7	16-22	1.35-1.40	0.60-2.00	0.22-0.24	Low-----	2.0-3.0	0.37	0.37	3	6	48
	7-12	18-27	1.30-1.35	0.60-2.00	0.20-0.22	Low-----	0.5-1.0	0.43	0.43			
	12-41	28-52	1.30-1.45	0.00-0.06	0.12-0.14	High-----	0.5-1.0	0.32	0.32			
	41-60	28-40	1.40-1.50	0.06-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
131B: Pershing-----	0-15	20-27	1.30-1.40	0.60-2.00	0.22-0.24	Low-----	2.5-3.5	0.37	0.37	3	6	48
	15-20	27-35	1.30-1.40	0.20-0.60	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	20-54	35-48	1.35-1.45	0.06-0.20	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
	54-60	24-40	1.35-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
131B2: Pershing-----	0-9	27-38	1.30-1.40	0.20-0.60	0.22-0.24	Moderate	2.0-3.0	0.37	0.37	3	7	38
	9-13	27-35	1.30-1.40	0.20-0.60	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	13-48	35-48	1.35-1.45	0.06-0.20	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
	48-60	24-40	1.35-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
131C2: Pershing-----	0-9	27-38	1.30-1.40	0.20-0.60	0.22-0.24	Moderate	2.0-3.0	0.37	0.37	3	7	38
	9-12	27-35	1.30-1.40	0.20-0.60	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	12-44	35-48	1.35-1.45	0.06-0.20	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
	44-60	24-40	1.35-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
132B: Weller-----	0-11	16-27	1.35-1.45	0.60-2.00	0.22-0.24	Low-----	2.0-3.0	0.37	0.37	3	6	48
	11-37	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	37-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
132C: Weller-----	0-10	16-27	1.35-1.45	0.60-2.00	0.22-0.24	Low-----	2.0-3.0	0.37	0.37	3	6	48
	10-36	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	36-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
132C2: Weller-----	0-8	27-36	1.35-1.45	0.20-0.60	0.22-0.24	High-----	1.5-2.5	0.37	0.37	3	7	38
	8-32	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	32-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
132D: Weller-----	0-9	16-27	1.35-1.45	0.60-2.00	0.22-0.24	Low-----	2.0-3.0	0.37	0.37	3	6	48
	9-35	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	35-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
132D2: Weller-----	0-7	27-36	1.35-1.45	0.20-0.60	0.22-0.24	High-----	1.5-2.5	0.37	0.37	3	7	38
	7-31	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	31-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
139: Perks-----	0-9	2-10	1.50-1.55	6.00-20.00	0.07-0.09	Low-----	0.5-2.0	0.17	0.17	5	2	134
	9-60	2-10	1.50-1.75	6.00-20.00	0.02-0.04	Low-----	0.0-0.5	0.15	0.15			
179D2: Gara-----	0-7	27-35	1.50-1.55	0.20-0.60	0.16-0.18	Moderate	2.0-3.0	0.32	0.32	5	6	48
	7-47	25-38	1.55-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.32	0.32			
	47-60	24-38	1.65-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.37	---			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
179E2: Gara-----	0-6	27-35	1.50-1.55	0.20-0.60	0.16-0.18	Moderate	2.0-3.0	0.32	0.32	5	6	48
	6-46	25-38	1.55-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.32	0.32			
	46-60	24-38	1.65-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.37	---			
180: Keomah-----	0-14	16-26	1.30-1.40	0.60-2.00	0.22-0.24	Low-----	2.5-3.5	0.37	0.37	3	6	48
	14-47	35-42	1.30-1.45	0.06-0.60	0.18-0.20	High-----	0.0-0.5	0.37	0.37			
	47-60	24-38	1.40-1.55	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
180B: Keomah-----	0-12	16-26	1.30-1.40	0.60-2.00	0.22-0.24	Low-----	2.0-3.0	0.37	0.37	3	6	48
	12-45	35-42	1.30-1.45	0.06-0.60	0.18-0.20	High-----	0.0-0.5	0.37	0.37			
	45-60	24-38	1.40-1.55	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
208: Klum-----	0-20	5-18	1.50-1.60	2.00-6.00	0.15-0.18	Low-----	1.5-2.5	0.20	0.20	5	3	86
	20-60	5-18	1.50-1.60	2.00-6.00	0.13-0.18	Low-----	0.0-0.5	0.20	0.20			
211: Edina-----	0-9	15-27	1.35-1.45	0.60-2.00	0.22-0.24	Moderate	3.5-4.5	0.37	0.37	3	6	48
	9-16	15-27	1.35-1.45	0.60-2.00	0.20-0.22	Moderate	0.5-1.0	0.37	0.37			
	16-47	45-60	1.30-1.45	0.00-0.06	0.11-0.13	Very high	0.0-0.5	0.37	0.37			
	47-60	27-40	1.35-1.50	0.06-0.20	0.18-0.20	High-----	0.0-0.5	0.37	0.37			
220: Nodaway-----	0-7	18-27	1.25-1.35	0.60-2.00	0.20-0.23	Low-----	2.0-3.0	0.32	0.32	5	6	48
	7-60	18-28	1.25-1.35	0.60-2.00	0.20-0.23	Moderate	0.0-0.5	0.43	0.43			
222C: Clarinda-----	0-12	27-38	1.45-1.50	0.20-0.60	0.17-0.19	Moderate	3.0-4.0	0.37	0.37	3	7	38
	12-21	40-60	1.50-1.65	0.00-0.06	0.14-0.16	High-----	0.5-1.0	0.37	0.37			
	21-60	40-60	1.50-1.65	0.00-0.06	0.14-0.16	High-----	0.0-0.5	0.37	0.37			
222C2: Clarinda-----	0-9	27-38	1.45-1.50	0.20-0.60	0.17-0.19	Moderate	2.2-3.2	0.37	0.37	3	7	38
	9-19	40-60	1.50-1.65	0.00-0.60	0.14-0.16	High-----	0.5-1.0	0.37	0.37			
	19-60	40-60	1.50-1.65	0.00-0.06	0.14-0.16	High-----	0.0-0.5	0.37	0.37			
223C2: Rinda-----	0-8	27-35	1.45-1.50	0.20-0.60	0.20-0.22	Moderate	2.0-3.0	0.43	0.43	3	7	38
	8-60	40-60	1.50-1.65	0.00-0.06	0.14-0.16	High-----	0.0-0.5	0.32	0.32			
260: Beckwith-----	0-5	16-22	1.35-1.40	0.60-2.00	0.22-0.24	Low-----	1.5-2.5	0.37	0.37	3	6	48
	5-15	18-27	1.30-1.35	0.60-2.00	0.20-0.22	Low-----	0.5-1.0	0.43	0.43			
	15-31	40-52	1.30-1.45	0.00-0.06	0.12-0.14	High-----	0.0-0.5	0.43	0.43			
	31-60	28-40	1.40-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
263: Okaw-----	0-17	15-27	1.20-1.40	0.60-2.00	0.22-0.24	Low-----	2.0-3.0	0.43	0.43	3	6	48
	17-40	40-60	1.35-1.60	0.00-0.06	0.09-0.18	High-----	---	0.32	0.32			
	40-55	35-60	1.45-1.70	0.00-0.06	0.08-0.18	High-----	---	0.32	0.32			
	55-60	35-55	1.50-1.70	0.00-0.06	0.08-0.20	High-----	---	0.32	0.32			
264B: Ainsworth-----	0-8	18-26	1.30-1.40	0.60-2.00	0.20-0.22	Low-----	2.0-3.0	0.37	0.37	4	6	48
	8-42	32-40	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-1.0	0.37	0.37			
	42-60	4-12	1.55-1.65	6.00-20.00	0.05-0.07	Low-----	0.0-0.5	0.37	0.37			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
273B:												
Olmitz-----	0-8	24-27	1.40-1.45	0.60-2.00	0.19-0.21	Moderate	3.0-4.0	0.24	0.24	5	6	48
	8-25	24-30	1.40-1.45	0.60-2.00	0.19-0.21	Moderate	2.0-3.0	0.28	0.28			
	25-60	27-34	1.45-1.55	0.60-2.00	0.15-0.17	Moderate	1.0-2.0	0.28	0.28			
279:												
Taintor-----	0-8	27-36	1.30-1.40	0.20-0.60	0.21-0.23	Moderate	5.0-6.0	0.28	0.28	5	7	38
	8-22	30-36	1.30-1.40	0.20-0.60	0.21-0.23	Moderate	2.0-3.0	0.32	0.32			
	22-46	35-44	1.30-1.45	0.20-0.60	0.14-0.18	High----	0.0-1.0	0.43	0.43			
	46-60	24-34	1.40-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
280:												
Mahaska-----	0-20	27-32	1.30-1.40	0.60-2.00	0.21-0.23	Moderate	5.0-6.0	0.28	0.28	5	7	38
	20-55	36-42	1.30-1.45	0.60-2.00	0.14-0.18	Moderate	1.0-2.0	0.43	0.43			
	55-60	24-32	1.40-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
280B:												
Mahaska-----	0-20	27-32	1.30-1.40	0.60-2.00	0.21-0.23	Moderate	4.5-5.5	0.28	0.28	5	7	38
	20-49	36-42	1.30-1.45	0.60-2.00	0.14-0.18	Moderate	1.0-2.0	0.43	0.43			
	49-60	24-32	1.40-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
281B:												
Otley-----	0-18	28-34	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	3.0-4.0	0.28	0.28	5	7	38
	18-41	36-42	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.43	0.43			
	41-60	24-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
281B2:												
Otley-----	0-9	28-34	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	2.2-3.2	0.32	0.32	5	7	38
	9-28	28-34	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	1.0-2.0	0.43	0.43			
	28-36	36-42	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	36-60	24-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
281C:												
Otley-----	0-15	28-34	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	3.0-4.0	0.28	0.28	5	7	38
	15-38	36-42	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.43	0.43			
	38-60	24-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
281C2:												
Otley-----	0-8	28-34	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	2.2-3.2	0.32	0.32	5	7	38
	8-26	28-34	1.25-1.35	0.60-2.00	0.21-0.23	Moderate	1.0-2.0	0.43	0.43			
	26-34	36-42	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	34-60	24-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
293C:												
Chelsea-----	0-5	8-15	1.50-1.55	6.00-20.00	0.10-0.15	Low-----	0.4-1.0	0.17	0.17	5	2	134
	5-60	5-10	1.55-1.70	6.00-20.00	0.06-0.08	Low-----	0.0-0.5	0.17	0.17			
Fayette-----	0-10	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low-----	2.0-3.0	0.32	0.32	5	6	48
	10-57	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	57-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
293F:												
Chelsea-----	0-5	8-15	1.50-1.55	6.00-20.00	0.10-0.15	Low-----	0.4-1.0	0.17	0.17	5	2	134
	5-60	5-10	1.55-1.70	6.00-20.00	0.06-0.08	Low-----	0.0-0.5	0.17	0.17			
Fayette-----	0-8	15-27	1.30-1.35	0.60-2.00	0.20-0.22	Low-----	2.0-3.0	0.32	0.32	5	6	48
	8-55	25-35	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	55-60	22-26	1.45-1.50	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
313E2:												
Gonport-----	0-8	27-34	1.30-1.40	0.20-0.60	0.14-0.16	Moderate	1.0-2.0	0.43	0.43	3	7	38
	8-22	36-60	1.50-1.60	0.00-0.06	0.12-0.14	High-----	0.0-0.5	0.32	0.32			
	22-60	---	---	0.00-0.06	---	-----	---	---	---			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permen- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
313G:												
Gosport-----	0-6	27-34	1.30-1.40	0.20-0.60	0.14-0.16	Moderate	2.0-3.0	0.43	0.43	3	7	38
	6-18	36-60	1.50-1.60	0.00-0.06	0.12-0.14	High-----	0.0-0.5	0.32	0.32			
	18-60	---	---	0.00-0.06	---	-----	---	---	---			
315:												
Nodaway-----	0-7	18-27	1.25-1.35	0.60-2.00	0.20-0.23	Low-----	2.0-3.0	0.32	0.32	5	6	48
	7-60	18-28	1.25-1.35	0.60-2.00	0.20-0.23	Moderate	0.0-0.5	0.43	0.43			
Klum-----	0-20	5-18	1.50-1.60	2.00-6.00	0.15-0.18	Low-----	1.5-2.5	0.20	0.20	5	3	86
	20-60	5-18	1.50-1.60	2.00-6.00	0.13-0.18	Low-----	0.0-0.5	0.20	0.20			
Perks-----	0-9	2-10	1.50-1.55	6.00-20.00	0.07-0.09	Low-----	0.5-2.0	0.15	0.15	5	1	160
	9-60	2-10	1.50-1.75	6.00-20.00	0.02-0.04	Low-----	0.0-0.5	0.15	0.15			
362:												
Haig-----	0-12	22-27	1.35-1.40	0.60-2.00	0.22-0.24	Moderate	3.5-4.5	0.37	0.37	3	6	48
	12-22	28-48	1.30-1.35	0.60-2.00	0.21-0.23	High-----	1.0-2.0	0.37	0.37			
	22-42	40-50	1.30-1.45	0.00-0.20	0.12-0.14	High-----	0.0-1.0	0.32	0.32			
	42-60	28-40	1.40-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
363:												
Haig-----	0-12	32-40	1.35-1.40	0.60-2.00	0.21-0.23	High-----	4.0-5.0	0.37	0.37	3	7	38
	12-22	28-48	1.30-1.35	0.60-2.00	0.21-0.23	High-----	1.0-2.0	0.37	0.37			
	22-42	40-50	1.30-1.45	0.00-0.20	0.12-0.14	High-----	0.0-1.0	0.32	0.32			
	42-60	28-40	1.40-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
364B:												
Grundy-----	0-15	28-35	1.35-1.45	0.20-0.60	0.18-0.20	High-----	3.0-4.0	0.37	0.37	3	7	38
	15-19	32-45	1.35-1.45	0.20-0.60	0.18-0.20	High-----	0.5-1.0	0.37	0.37			
	19-42	40-50	1.30-1.40	0.06-0.20	0.11-0.13	High-----	0.0-0.5	0.37	0.37			
	42-60	28-35	1.35-1.40	0.06-0.20	0.18-0.20	High-----	0.0-0.5	0.37	0.37			
364B2:												
Grundy-----	0-10	28-35	1.35-1.45	0.20-0.60	0.18-0.20	High-----	2.7-3.7	0.37	0.37	3	7	38
	10-15	32-45	1.35-1.45	0.20-0.60	0.18-0.20	High-----	0.5-1.0	0.37	0.37			
	15-38	40-50	1.30-1.40	0.06-0.20	0.11-0.13	High-----	0.0-0.5	0.37	0.37			
	38-60	28-35	1.35-1.40	0.06-0.20	0.18-0.20	High-----	0.0-0.5	0.37	0.37			
423D2:												
Bucknell-----	0-6	27-38	1.45-1.50	0.20-0.60	0.17-0.21	Moderate	2.0-3.0	0.37	0.37	3	7	38
	6-50	38-50	1.55-1.65	0.00-0.20	0.13-0.17	High-----	0.0-0.5	0.32	0.32			
	50-60	30-40	1.60-1.70	0.06-0.20	0.14-0.18	High-----	0.0-0.5	0.32	0.32			
424D2:												
Lindley-----	0-9	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low-----	1.5-2.5	0.32	0.32	5	6	48
	9-43	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	43-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			
Keswick-----	0-10	22-27	1.45-1.50	0.60-2.00	0.17-0.22	Moderate	1.5-2.5	0.37	0.37	3	6	48
	10-29	35-60	1.55-1.60	0.06-0.20	0.11-0.15	High-----	0.0-0.5	0.37	0.37			
	29-60	30-40	1.60-1.75	0.20-0.60	0.12-0.16	Moderate	0.0-0.5	0.37	0.37			
424E2:												
Lindley-----	0-8	18-27	1.20-1.40	0.60-2.00	0.16-0.18	Low-----	1.5-2.5	0.32	0.32	5	6	48
	8-42	25-35	1.40-1.60	0.20-0.60	0.14-0.18	Moderate	0.1-1.0	0.32	0.32			
	42-60	18-32	1.45-1.65	0.20-0.60	0.12-0.16	Moderate	0.1-0.5	0.32	0.32			
Keswick-----	0-9	22-27	1.45-1.50	0.60-2.00	0.17-0.22	Moderate	1.5-2.5	0.37	0.37	3	6	48
	9-27	35-60	1.55-1.60	0.06-0.20	0.11-0.15	High-----	0.0-0.5	0.37	0.37			
	27-60	30-40	1.60-1.75	0.20-0.60	0.12-0.16	Moderate	0.0-0.5	0.37	0.37			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Perme- ability	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
425D:												
Keswick-----	0-12	22-27	1.45-1.50	0.60-2.00	0.17-0.22	Moderate	2.0-3.0	0.32	0.32	3	6	48
	12-31	35-60	1.55-1.60	0.06-0.20	0.11-0.15	High-----	0.0-0.5	0.37	0.37			
	31-60	30-40	1.60-1.75	0.20-0.60	0.12-0.16	Moderate	0.0-0.5	0.37	0.37			
425D2:												
Keswick-----	0-10	27-40	1.45-1.50	0.20-0.60	0.17-0.19	Moderate	1.0-2.0	0.37	0.37	3	4	86
	10-29	35-60	1.55-1.60	0.06-0.20	0.11-0.15	High-----	0.0-0.5	0.37	0.37			
	29-60	30-40	1.60-1.75	0.20-0.60	0.12-0.16	Moderate	0.0-0.5	0.37	0.37			
430:												
Ackmore-----	0-8	18-27	1.25-1.30	0.60-2.00	0.21-0.23	Moderate	1.0-3.0	0.32	0.32	5	6	48
	8-27	18-30	1.25-1.30	0.60-2.00	0.21-0.23	Moderate	1.0-3.0	0.32	0.32			
	27-60	26-38	1.30-1.40	0.60-2.00	0.18-0.20	High-----	3.0-5.0	0.32	0.32			
453:												
Tuskeego-----	0-14	16-22	1.35-1.40	0.60-2.00	0.19-0.23	Moderate	3.0-4.0	0.37	0.37	5	5	56
	14-46	18-30	1.40-1.50	0.06-0.20	0.18-0.22	Moderate	1.0-2.0	0.43	---			
	46-60	32-48	1.30-1.45	0.00-0.06	0.13-0.17	High-----	0.0-2.0	0.43	0.43			
499G:												
Nordness-----	0-4	18-24	1.30-1.35	0.60-2.00	0.20-0.22	Low-----	2.0-3.0	0.32	0.32	1	6	48
	4-11	22-29	1.35-1.45	0.60-2.00	0.20-0.22	Moderate	0.5-1.0	0.32	0.32			
	11-17	22-35	1.35-1.60	0.06-0.20	0.12-0.15	High-----	0.0-0.5	0.37	0.37			
	17-60	---	---	0.00-0.06	---	-----	---	---	---			
520:												
Coppock-----	0-9	16-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	2.5-3.5	0.32	0.32	5	6	48
	9-29	16-27	1.30-1.40	0.60-2.00	0.18-0.22	Moderate	0.0-1.0	0.43	0.43			
	29-53	25-35	1.30-1.40	0.60-2.00	0.17-0.21	Moderate	0.0-0.5	0.43	0.43			
	53-60	24-40	1.40-1.45	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.43	0.43			
520B:												
Coppock-----	0-9	16-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	2.5-3.5	0.32	0.32	5	6	48
	9-29	16-27	1.30-1.40	0.60-2.00	0.18-0.22	Moderate	0.0-1.0	0.43	0.43			
	29-53	24-35	1.30-1.40	0.60-2.00	0.17-0.21	Moderate	0.0-0.5	0.43	0.43			
	53-60	24-40	1.40-1.45	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.43	0.43			
570C2:												
Nira-----	0-11	28-34	1.25-1.40	0.60-2.00	0.21-0.23	Moderate	2.2-3.2	0.32	0.32	5	7	38
	11-39	30-38	1.25-1.40	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	39-60	24-34	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
571C2:												
Hedrick-----	0-7	27-34	1.30-1.35	0.60-2.00	0.20-0.22	Moderate	2.0-3.0	0.32	0.32	5	7	38
	7-56	27-37	1.30-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-1.0	0.43	0.43			
	56-60	24-32	1.40-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
572C2:												
Inton-----	0-7	27-35	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	2.0-3.0	0.37	0.37	5	7	38
	7-48	27-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
	48-60	25-32	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
572D2:												
Inton-----	0-5	27-35	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	2.0-3.0	0.37	0.37	5	7	38
	5-46	27-35	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
	46-60	25-32	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
587:												
Chequest-----	0-17	30-35	1.30-1.35	0.20-0.60	0.18-0.20	High-----	3.0-4.0	0.32	0.32	5	7	38
	17-60	35-42	1.35-1.45	0.20-0.60	0.14-0.18	High-----	0.0-1.0	0.43	0.43			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
594D2:												
Galland-----	0-7	27-35	1.45-1.50	0.60-2.00	0.19-0.21	Moderate	1.0-2.0	0.37	0.37	3	6	48
	7-54	35-48	1.50-1.65	0.06-0.20	0.14-0.19	High-----	0.0-0.5	0.37	0.37			
	54-60	10-45	1.55-1.75	0.60-6.00	0.11-0.13	Low-----	0.0-0.5	0.24	0.24			
729:												
Nodaway-----	0-7	18-27	1.25-1.35	0.60-2.00	0.20-0.23	Low-----	2.0-3.0	0.32	0.32	5	6	48
	7-60	18-28	1.25-1.35	0.60-2.00	0.20-0.23	Moderate	0.0-0.5	0.43	0.43			
Coppock-----	0-9	16-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	2.5-3.5	0.32	0.32	5	6	48
	9-29	16-27	1.30-1.40	0.60-2.00	0.18-0.22	Moderate	0.0-1.0	0.43	0.43			
	29-53	25-35	1.30-1.40	0.60-2.00	0.17-0.21	Moderate	0.0-0.5	0.43	0.43			
	53-60	24-40	1.40-1.45	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.43	0.43			
730B:												
Nodaway-----	0-7	18-27	1.25-1.35	0.60-2.00	0.20-0.23	Low-----	1.0-3.0	0.32	0.32	5	6	48
	7-60	18-28	1.25-1.35	0.60-2.00	0.20-0.23	Moderate	0.0-0.5	0.43	0.43			
Coppock-----	0-9	16-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	1.0-3.0	0.32	0.32	5	6	48
	9-29	16-27	1.30-1.40	0.60-2.00	0.18-0.22	Moderate	0.0-1.0	0.43	0.43			
	29-53	24-35	1.30-1.40	0.60-2.00	0.17-0.21	Moderate	0.0-0.5	0.43	0.43			
	53-60	24-40	1.40-1.45	0.60-2.00	0.15-0.19	Moderate	0.0-0.5	0.43	0.43			
Cantril-----	0-13	14-27	1.40-1.45	0.60-2.00	0.17-0.19	Low-----	1.0-3.0	0.28	0.28	5	6	48
	13-60	27-35	1.45-1.75	0.60-2.00	0.14-0.16	Moderate	0.0-1.0	0.32	0.32			
779:												
Kalona-----	0-20	36-39	1.35-1.40	0.20-0.60	0.18-0.20	High-----	5.0-6.0	0.32	0.32	5	4	86
	20-41	36-42	1.40-1.45	0.20-0.60	0.14-0.18	High-----	2.0-3.0	0.37	0.37			
	41-60	26-34	1.45-1.50	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
792C2:												
Armstrong-----	0-7	35-42	1.45-1.50	0.20-0.60	0.18-0.20	Moderate	2.0-3.0	0.32	0.32	3	4	86
	7-60	36-60	1.55-1.60	0.06-0.20	0.11-0.16	High-----	0.0-1.0	0.32	0.32			
792D2:												
Armstrong-----	0-6	35-42	1.45-1.50	0.20-0.60	0.18-0.20	Moderate	2.0-3.0	0.32	0.32	3	4	86
	6-60	36-60	1.55-1.60	0.06-0.20	0.11-0.16	High-----	0.0-1.0	0.32	0.32			
795C2:												
Ashgrove-----	0-9	27-40	1.45-1.50	0.20-0.60	0.18-0.20	Moderate	1.5-2.5	0.43	0.43	3	7	38
	9-18	35-45	1.45-1.50	0.00-0.06	0.12-0.14	High-----	0.0-0.5	0.32	0.32			
	18-60	40-60	1.50-1.65	0.00-0.06	0.12-0.14	High-----	0.0-0.5	0.32	0.32			
795D2:												
Ashgrove-----	0-7	27-40	1.45-1.50	0.20-0.60	0.18-0.20	Moderate	1.5-2.5	0.43	0.43	3	7	38
	7-16	35-45	1.45-1.50	0.00-0.06	0.12-0.14	High-----	0.0-0.5	0.32	0.32			
	16-60	40-60	1.50-1.65	0.00-0.06	0.12-0.14	High-----	0.0-0.5	0.32	0.32			
822D2:												
Lamoni-----	0-12	27-40	1.45-1.50	0.20-0.60	0.17-0.21	Moderate	2.2-3.2	0.37	0.37	3	7	38
	12-52	38-50	1.55-1.65	0.00-0.20	0.13-0.17	High-----	0.5-2.0	0.37	0.37			
	52-60	32-40	1.60-1.70	0.06-0.20	0.14-0.18	High-----	0.0-0.5	0.37	0.37			
831B:												
Pershing-----	0-15	20-27	1.30-1.40	0.60-2.00	0.22-0.24	Low-----	2.5-3.5	0.37	0.37	3	6	48
	15-20	27-35	1.30-1.40	0.20-0.60	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	20-54	35-48	1.35-1.45	0.06-0.20	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
	54-60	24-40	1.35-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
831C2: Pershing-----	0-9	27-38	1.30-1.40	0.20-0.60	0.22-0.24	Moderate	2.0-3.0	0.37	0.37	3	7	38
	9-12	27-35	1.30-1.40	0.20-0.60	0.20-0.22	Moderate	0.0-1.0	0.43	0.43			
	12-44	35-48	1.35-1.45	0.06-0.20	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
	44-60	24-40	1.35-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
832B: Weller-----	0-11	16-27	1.35-1.45	0.60-2.00	0.22-0.24	Low-----	2.0-3.0	0.37	0.37	3	6	48
	11-37	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	37-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
832C2: Weller-----	0-8	27-36	1.35-1.45	0.20-0.60	0.22-0.24	High-----	1.5-2.5	0.37	0.37	3	7	38
	8-32	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	32-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
832D2: Weller-----	0-7	27-36	1.35-1.45	0.20-0.60	0.22-0.24	High-----	1.5-2.5	0.37	0.37	3	7	38
	7-31	28-48	1.35-1.50	0.06-0.20	0.12-0.18	High-----	0.0-0.5	0.43	0.43			
	31-60	25-40	1.40-1.55	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
876B: Ladoga-----	0-13	18-27	1.30-1.35	0.60-2.00	0.22-0.24	Low-----	2.5-3.5	0.32	0.32	5	6	48
	13-45	36-42	1.30-1.40	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	45-60	24-32	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
876C2: Ladoga-----	0-11	27-35	1.30-1.35	0.60-2.00	0.22-0.24	Low-----	2.0-3.0	0.32	0.32	5	7	38
	11-43	36-42	1.30-1.40	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	43-60	24-32	1.35-1.45	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
880B: Clinton-----	0-10	16-26	1.30-1.40	0.60-2.00	0.20-0.22	Low-----	2.0-3.0	0.37	0.37	5	6	48
	10-32	36-42	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-1.0	0.37	0.37			
	32-60	24-35	1.40-1.55	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
880C2: Clinton-----	0-9	27-34	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.37	0.37	5	7	38
	9-27	36-42	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-0.5	0.37	0.37			
	27-60	24-35	1.40-1.55	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
880D2: Clinton-----	0-8	27-34	1.30-1.40	0.60-2.00	0.18-0.20	Moderate	1.0-2.0	0.37	0.37	5	7	38
	8-26	36-42	1.35-1.45	0.20-0.60	0.16-0.20	Moderate	0.0-0.5	0.37	0.37			
	26-60	24-35	1.40-1.55	0.60-2.00	0.18-0.20	Moderate	0.0-0.5	0.37	0.37			
977: Richwood-----	0-15	15-22	1.35-1.60	0.60-2.00	0.22-0.24	Low-----	3.5-4.5	0.28	0.28	4	5	56
	15-60	18-30	1.55-1.65	0.60-2.00	0.18-0.22	Moderate	0.5-1.0	0.43	0.43			
993D2: Gara-----	0-7	27-35	1.50-1.55	0.20-0.60	0.16-0.18	Moderate	2.0-3.0	0.32	0.32	5	6	48
	7-47	25-38	1.55-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.32	0.32			
	47-60	24-38	1.65-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.37	---			
Armstrong-----	0-6	22-27	1.45-1.50	0.60-2.00	0.20-0.22	Moderate	2.0-3.0	0.32	0.32	3	6	48
	6-60	36-60	1.55-1.60	0.06-0.20	0.11-0.16	High-----	0.0-1.0	0.32	0.32			
993E2: Gara-----	0-6	27-35	1.50-1.55	0.20-0.60	0.16-0.18	Moderate	2.0-3.0	0.32	0.32	5	6	48
	6-46	25-38	1.55-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.32	0.32			
	46-60	24-38	1.65-1.75	0.20-0.60	0.16-0.18	Moderate	0.0-0.5	0.37	---			

Physical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Moist bulk density	Permea- bility	Available water capacity	Shrink- swell potential	Organic matter	Erosion factors			Wind erodi- bility group	Wind erodi- bility index
								K	Kf	T		
	In	Pct	g/cc	In/hr	In/in		Pct					
993E2: Armstrong-----	0-5	22-27	1.45-1.50	0.60-2.00	0.20-0.22	Moderate	2.0-3.0	0.32	0.32	3	6	48
	5-60	36-60	1.55-1.60	0.06-0.20	0.11-0.16	High-----	0.0-1.0	0.32	0.32			
994D2: Galland-----	0-7	22-27	1.45-1.50	0.60-2.00	0.19-0.21	Moderate	1.5-2.5	0.37	0.37	3	6	48
	7-54	35-48	1.50-1.65	0.06-0.20	0.14-0.19	High-----	0.0-0.5	0.37	0.37			
	54-60	10-45	1.55-1.75	0.60-6.00	0.11-0.13	Low-----	0.0-0.5	0.24	0.24			
Douds-----	0-8	20-27	1.45-1.50	0.60-2.00	0.15-0.17	Low-----	1.5-2.5	0.32	0.32	5	6	48
	8-33	26-35	1.45-1.65	0.60-2.00	0.15-0.17	Moderate	0.0-1.0	0.32	0.32			
	33-60	5-30	1.55-1.75	0.60-6.00	0.11-0.13	Low-----	0.0-0.5	0.32	0.32			
994E2: Galland-----	0-8	22-27	1.45-1.50	0.60-2.00	0.19-0.21	Moderate	1.5-2.5	0.37	0.37	3	6	48
	8-55	35-48	1.50-1.65	0.06-0.20	0.14-0.19	High-----	0.0-0.5	0.37	0.37			
	55-60	10-45	1.55-1.75	0.60-6.00	0.11-0.13	Low-----	0.0-0.5	0.24	0.24			
Douds-----	0-12	20-27	1.45-1.50	0.60-2.00	0.15-0.17	Low-----	1.5-2.5	0.32	0.32	5	6	48
	12-37	26-35	1.45-1.65	0.60-2.00	0.15-0.17	Moderate	0.0-1.0	0.32	0.32			
	37-60	5-30	1.55-1.75	0.60-6.00	0.11-0.13	Low-----	0.0-0.5	0.32	0.32			
1075B: Givin-----	0-10	18-26	1.30-1.40	0.60-2.00	0.22-0.24	Moderate	2.5-3.5	0.32	0.32	5	6	48
	10-37	36-42	1.30-1.45	0.20-0.60	0.18-0.20	Moderate	0.5-1.0	0.43	0.43			
	37-60	27-34	1.40-1.50	0.20-0.60	0.18-0.20	Moderate	0.0-0.5	0.43	0.43			
1130: Belinda-----	0-7	16-22	1.35-1.40	0.60-2.00	0.22-0.24	Low-----	2.0-3.0	0.37	0.37	3	6	48
	7-12	18-27	1.30-1.35	0.60-2.00	0.20-0.22	Low-----	0.5-1.0	0.43	0.43			
	12-41	28-52	1.30-1.45	0.00-0.06	0.12-0.14	High-----	0.5-1.0	0.32	0.32			
	41-60	28-40	1.40-1.50	0.06-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
1260: Beckwith-----	0-5	16-22	1.35-1.40	0.60-2.00	0.22-0.24	Low-----	1.5-2.5	0.37	0.37	3	6	48
	5-15	18-27	1.30-1.35	0.60-2.00	0.20-0.22	Low-----	0.5-1.0	0.43	0.43			
	15-31	40-52	1.30-1.45	0.00-0.06	0.12-0.14	High-----	0.0-0.5	0.43	0.43			
	31-60	28-40	1.40-1.50	0.20-0.60	0.18-0.20	High-----	0.0-0.5	0.43	0.43			
1715: Nodaway-----	0-7	18-27	1.25-1.35	0.60-2.00	0.20-0.23	Low-----	2.0-3.0	0.32	0.32	5	6	48
	7-60	18-28	1.25-1.35	0.60-2.00	0.20-0.23	Moderate	0.0-0.5	0.43	0.43			
Vesser-----	0-10	20-26	1.30-1.35	0.60-2.00	0.20-0.24	Moderate	3.0-4.0	0.28	0.28	5	6	48
	10-25	18-22	1.35-1.40	0.60-2.00	0.18-0.22	Moderate	1.0-2.0	0.43	0.43			
	25-60	30-35	1.40-1.45	0.60-2.00	0.17-0.21	Moderate	0.0-1.0	0.43	0.43			
Ackmore-----	0-8	18-27	1.25-1.30	0.60-2.00	0.21-0.23	Moderate	1.0-3.0	0.32	0.32	5	6	48
	8-27	18-30	1.25-1.30	0.60-2.00	0.21-0.23	Moderate	1.0-3.0	0.32	0.32			
	27-60	26-38	1.30-1.40	0.60-2.00	0.18-0.20	High-----	3.0-5.0	0.32	0.32			
5020: Pits and Dumps--	0-60	---	---	0.01-20.00	---	-----	---	---	---	5	8	---
5030: Pits-----	0-60	---	---	0.01-20.00	---	-----	---	---	---	5	8	---
5040: Orthents-----	0-60	2-18	1.50-1.70	0.60-2.00	0.08-0.14	Low-----	---	0.24	---	5	3	86
	60-80	---	---	0.06-2.00	---	-----	---	---	---			

Chemical Properties of the Soils

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
13B:					
Olmitz-----	0-8	24-27	20.0-25.0	5.6-7.3	---
	8-25	24-30	20.0-25.0	5.6-7.3	---
	25-60	27-34	20.0-25.0	5.1-6.5	---
Vesser-----	0-10	20-26	25.0-30.0	5.6-7.3	---
	10-25	18-22	20.0-25.0	5.1-6.0	---
	25-60	30-35	25.0-30.0	5.6-6.5	---
Zook-----	0-18	35-40	36.0-41.0	5.6-7.3	---
	18-60	36-45	36.0-41.0	5.6-7.8	0-15
23C2:					
Arispe-----	0-8	28-38	25.0-30.0	5.6-7.3	---
	8-13	38-42	25.0-30.0	5.6-7.3	---
	13-52	30-38	25.0-30.0	6.6-7.3	---
	52-60	24-35	25.0-30.0	5.6-7.3	---
24D2:					
Shelby-----	0-8	27-35	20.0-25.0	5.1-7.3	---
	8-16	30-35	20.0-25.0	5.1-7.3	---
	16-45	30-35	20.0-25.0	5.1-7.3	---
	45-60	30-35	20.0-25.0	6.6-8.4	0-30
41B:					
Sparta-----	0-20	3-10	10.0-15.0	5.6-7.3	---
	20-30	1-8	1.0-6.0	5.1-7.3	---
	30-60	0-5	1.0-4.0	5.1-7.8	---
51:					
Vesser-----	0-10	20-26	25.0-30.0	5.6-7.3	---
	10-25	18-22	20.0-25.0	5.1-6.0	---
	25-60	30-35	25.0-30.0	5.1-6.5	---
51B:					
Vesser-----	0-10	20-26	25.0-30.0	5.6-7.3	---
	10-25	18-22	20.0-25.0	5.1-6.0	---
	25-60	30-35	25.0-30.0	5.6-6.5	---
54:					
Zook-----	0-18	35-40	36.0-41.0	5.6-7.3	---
	18-53	36-45	36.0-41.0	5.6-7.8	---
	53-60	20-45	30.0-36.0	5.6-7.8	---
65D2:					
Lindley-----	0-9	18-27	20.0-25.0	4.5-7.3	---
	9-43	25-35	15.0-20.0	4.5-6.5	---
	43-60	18-32	10.0-16.0	6.1-7.8	---
65E:					
Lindley-----	0-10	18-27	15.0-20.0	4.5-7.3	---
	10-50	25-35	15.0-20.0	4.5-6.5	---
	50-60	18-32	10.0-16.0	6.1-7.8	---
65E2:					
Lindley-----	0-8	18-27	20.0-25.0	4.5-7.3	---
	8-42	25-35	15.0-20.0	4.5-6.5	---
	42-60	18-32	10.0-16.0	6.1-7.8	---
65F2:					
Lindley-----	0-7	18-27	20.0-25.0	4.5-7.3	---
	7-41	25-35	15.0-20.0	4.5-6.5	---
	41-60	18-32	10.0-16.0	6.1-7.8	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
65G:					
Lindley-----	0-10	18-27	15.0-20.0	4.5-7.3	---
	10-48	25-35	15.0-20.0	4.5-6.5	---
	48-60	18-32	10.0-16.0	6.1-7.8	---
74:					
Rubio-----	0-8	16-22	20.0-25.0	5.1-7.3	---
	8-16	16-22	15.0-20.0	5.1-6.0	---
	16-47	35-42	25.0-30.0	5.1-5.5	---
	47-60	32-40	20.0-25.0	5.1-7.3	---
75:					
Givin-----	0-14	18-26	20.0-25.0	5.6-7.3	---
	14-41	36-42	20.0-25.0	5.1-5.5	---
	41-60	27-34	20.0-25.0	5.1-6.0	---
75B:					
Givin-----	0-10	18-26	20.0-25.0	5.6-7.3	---
	10-37	36-42	20.0-25.0	5.1-5.5	---
	37-60	27-34	20.0-25.0	5.1-6.0	---
76B:					
Ladoga-----	0-13	18-27	20.0-25.0	6.1-7.3	---
	13-45	36-42	20.0-25.0	5.1-6.0	---
	45-60	24-32	20.0-25.0	5.1-6.5	---
76C2:					
Ladoga-----	0-11	27-35	25.0-30.0	6.1-7.3	---
	11-43	36-42	25.0-30.0	5.1-6.0	---
	43-60	24-32	20.0-25.0	5.1-6.5	---
76D2:					
Ladoga-----	0-10	27-35	25.0-30.0	6.1-7.3	---
	10-40	36-42	25.0-30.0	5.1-6.0	---
	40-60	24-32	20.0-25.0	5.1-6.5	---
80B:					
Clinton-----	0-10	16-26	15.0-20.0	5.1-7.3	---
	10-32	36-42	25.0-30.0	4.5-6.0	---
	32-60	24-35	20.0-25.0	6.1-6.5	---
80C2:					
Clinton-----	0-9	27-34	20.0-25.0	5.1-7.3	---
	9-27	36-42	25.0-30.0	4.5-6.0	---
	27-60	24-35	20.0-25.0	6.1-6.5	---
80D2:					
Clinton-----	0-8	27-34	20.0-25.0	5.1-7.3	---
	8-26	36-42	25.0-30.0	4.5-6.0	---
	26-60	24-35	20.0-25.0	6.1-6.5	---
87B:					
Celo-----	0-22	27-36	36.0-41.0	5.6-7.3	---
	22-52	30-35	36.0-41.0	5.6-7.3	---
	52-60	25-35	30.0-36.0	6.1-7.3	---
Zook-----	0-18	35-40	36.0-41.0	5.6-7.3	---
	18-60	36-45	36.0-41.0	5.6-7.8	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate
	In Pct	Pct	meq/100g	pH	Pct
122:					
Sperry-----	0-10	18-22	25.0-30.0	5.6-7.3	---
	10-18	18-22	20.0-25.0	5.6-7.3	---
	18-35	38-45	30.0-36.0	5.1-6.5	---
	35-60	26-34	25.0-30.0	5.6-6.5	---
130:					
Belinda-----	0-7	16-22	20.0-25.0	5.6-7.3	---
	7-12	18-27	20.0-25.0	4.5-6.0	---
	12-41	28-52	30.0-36.0	4.5-6.5	---
	41-60	28-40	30.0-36.0	5.1-6.0	---
131B:					
Pershing-----	0-15	20-27	20.0-25.0	4.5-7.3	---
	15-20	27-35	25.0-30.0	5.1-6.0	---
	20-54	35-48	30.0-36.0	5.1-6.0	---
	54-60	24-40	25.0-30.0	5.1-6.5	---
131B2:					
Pershing-----	0-9	27-38	25.0-30.0	4.5-7.3	---
	9-13	27-35	25.0-30.0	5.1-6.0	---
	13-48	35-48	30.0-36.0	5.1-6.0	---
	48-60	24-40	25.0-30.0	5.1-6.5	---
131C2:					
Pershing-----	0-9	27-38	25.0-30.0	4.5-7.3	---
	9-12	27-35	25.0-30.0	5.1-6.0	---
	12-44	35-48	30.0-36.0	5.1-6.0	---
	44-60	24-40	25.0-30.0	5.1-6.5	---
132B:					
Weller-----	0-11	16-27	15.0-20.0	4.5-7.3	---
	11-37	28-48	30.0-35.0	4.5-6.0	---
	37-60	25-40	25.0-30.0	5.1-6.5	---
132C:					
Weller-----	0-10	16-27	15.0-20.0	4.5-7.3	---
	10-36	28-48	30.0-35.0	4.5-6.0	---
	36-60	25-40	25.0-30.0	5.1-6.5	---
132C2:					
Weller-----	0-8	27-36	25.0-30.0	4.5-7.3	---
	8-32	28-48	30.0-35.0	4.5-6.0	---
	32-60	25-40	25.0-30.0	5.1-6.5	---
132D:					
Weller-----	0-9	16-27	15.0-20.0	4.5-7.3	---
	9-35	28-48	30.0-35.0	4.5-6.0	---
	35-60	25-40	25.0-30.0	5.1-6.5	---
132D2:					
Weller-----	0-7	27-36	25.0-30.0	4.5-7.3	---
	7-31	28-48	30.0-35.0	4.5-6.0	---
	31-60	25-40	25.0-30.0	5.1-6.5	---
139:					
Perks-----	0-9	2-10	5.0-10.0	5.6-7.3	---
	9-60	2-10	5.0-10.0	5.6-7.3	---
179D2:					
Gara-----	0-7	27-35	25.0-30.0	5.6-7.3	---
	7-47	25-38	25.0-30.0	4.5-6.5	---
	47-60	24-38	25.0-30.0	5.6-8.4	0-25

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
179E2:					
Gara-----	0-6	27-35	25.0-30.0	5.6-7.3	---
	6-46	25-38	25.0-30.0	4.5-6.5	---
	46-60	24-38	25.0-30.0	5.6-8.4	0-25
180:					
Keomah-----	0-14	16-26	15.0-20.0	5.1-7.3	---
	14-47	35-42	25.0-30.0	4.5-5.5	---
	47-60	24-38	15.0-20.0	5.1-7.3	---
180B:					
Keomah-----	0-12	16-26	15.0-20.0	5.1-7.3	---
	12-45	35-42	25.0-30.0	4.5-5.5	---
	45-60	24-38	15.0-20.0	5.1-7.3	---
208:					
Klum-----	0-20	5-18	10.0-15.0	6.1-7.3	---
	20-60	5-18	10.0-15.0	6.1-7.3	---
211:					
Edina-----	0-9	15-27	25.0-30.0	5.1-7.3	---
	9-16	15-27	14.0-20.0	5.1-7.3	---
	16-47	45-60	28.0-42.0	5.1-7.3	---
	47-60	27-40	20.0-30.0	6.1-7.3	---
220:					
Nodaway-----	0-7	18-27	20.0-25.0	6.1-7.3	---
	7-60	18-28	20.0-25.0	6.1-7.3	---
222C:					
Clarinda-----	0-12	27-38	36.0-41.0	5.1-7.3	---
	12-21	40-60	41.0-50.0	5.1-6.5	---
	21-60	40-60	41.0-50.0	5.6-8.4	0-30
222C2:					
Clarinda-----	0-9	27-38	36.0-41.0	5.1-7.3	---
	9-19	40-60	41.0-50.0	5.1-6.5	---
	19-60	40-60	41.0-50.0	5.6-8.4	0-30
223C2:					
Rinda-----	0-8	27-35	30.0-36.0	5.1-7.3	---
	8-60	40-60	41.0-50.0	5.1-7.3	---
260:					
Beckwith-----	0-5	16-22	15.0-20.0	4.5-7.3	---
	5-15	18-27	15.0-20.0	4.5-5.5	---
	15-31	40-52	36.0-41.0	5.1-6.0	---
	31-60	28-40	30.0-36.0	5.6-6.5	---
263:					
Okaw-----	0-17	15-27	15.0-20.0	4.5-7.3	---
	17-40	40-60	---	4.5-6.0	---
	40-55	35-60	---	4.5-7.3	---
	55-60	35-55	---	3.6-8.4	---
264B:					
Ainsworth-----	0-8	18-26	15.0-20.0	6.1-7.3	---
	8-42	32-40	15.0-20.0	4.5-6.5	---
	42-60	4-12	5.0-10.0	4.5-7.3	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth		Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate
	In	Pct				
273B:						
Olmitz-----	0-8	24-27	20.0-25.0	5.6-7.3	---	
	8-25	24-30	20.0-25.0	5.6-7.3	---	
	25-60	27-34	20.0-25.0	5.1-6.5	---	
279:						
Taintor-----	0-8	27-36	36.0-41.0	5.6-7.3	---	
	8-22	30-36	36.0-41.0	5.6-7.3	---	
	22-46	35-44	30.0-36.0	5.6-6.5	---	
	46-60	24-34	25.0-30.0	6.1-7.8	0-15	
280:						
Mahaska-----	0-20	27-32	30.0-36.0	5.1-7.3	---	
	20-55	36-42	30.0-36.0	4.5-6.0	---	
	55-60	24-32	25.0-30.0	5.6-7.3	---	
280B:						
Mahaska-----	0-20	27-32	30.0-36.0	5.1-7.3	---	
	20-49	36-42	30.0-36.0	4.5-6.0	---	
	49-60	24-32	25.0-30.0	5.6-7.3	---	
281B:						
Otley-----	0-18	28-34	25.0-30.0	5.1-7.3	---	
	18-41	36-42	25.0-30.0	5.1-5.5	---	
	41-60	24-35	25.0-30.0	5.6-7.3	---	
281B2:						
Otley-----	0-9	28-34	25.0-30.0	5.1-7.3	---	
	9-28	28-34	25.0-30.0	5.1-7.3	---	
	28-36	36-42	25.0-30.0	5.1-5.5	---	
	36-60	24-35	25.0-30.0	5.6-7.3	---	
281C:						
Otley-----	0-15	28-34	25.0-30.0	5.1-7.3	---	
	15-38	36-42	25.0-30.0	5.1-5.5	---	
	38-60	24-35	25.0-30.0	5.6-7.3	---	
281C2:						
Otley-----	0-8	28-34	25.0-30.0	5.1-7.3	---	
	8-26	28-34	25.0-30.0	5.1-7.3	---	
	26-34	36-42	25.0-30.0	5.1-5.5	---	
	34-60	24-35	25.0-30.0	5.6-7.3	---	
293C:						
Chelsea-----	0-5	8-15	5.0-10.0	5.1-7.3	---	
	5-60	5-10	5.0-10.0	5.1-6.5	---	
Fayette-----	0-10	15-27	15.0-20.0	5.1-7.3	---	
	10-57	25-35	15.0-20.0	4.5-6.5	---	
	57-60	22-26	15.0-20.0	5.1-7.8	0-15	
293F:						
Chelsea-----	0-5	8-15	5.0-10.0	5.1-7.3	---	
	5-60	5-10	5.0-10.0	5.1-6.5	---	
Fayette-----	0-8	15-27	15.0-20.0	5.1-7.3	---	
	8-55	25-35	15.0-20.0	4.5-6.5	---	
	55-60	22-26	15.0-20.0	5.1-7.8	0-15	
313E2:						
Gosport-----	0-8	27-34	15.0-20.0	5.1-7.3	---	
	8-22	36-60	30.0-50.0	3.6-5.5	---	
	22-60	---	---	---	---	

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
313G:					
Gosport-----	0-6	27-34	15.0-20.0	5.1-7.3	---
	6-18	36-60	30.0-50.0	3.6-5.5	---
	18-60	---	---	---	---
315:					
Nodaway-----	0-7	18-27	20.0-25.0	6.1-7.3	---
	7-60	18-28	20.0-25.0	6.1-7.3	---
Klum-----	0-20	5-18	10.0-15.0	6.1-7.3	---
	20-60	5-18	10.0-15.0	6.1-7.3	---
Perks-----	0-9	2-10	5.0-10.0	5.6-7.3	---
	9-60	2-10	5.0-10.0	5.6-7.3	---
362:					
Haig-----	0-12	22-27	36.0-41.0	5.6-7.3	---
	12-22	28-48	36.0-41.0	5.1-6.0	---
	22-42	40-50	36.0-41.0	5.1-6.0	---
	42-60	28-40	36.0-41.0	6.1-7.3	---
363:					
Haig-----	0-12	32-40	36.0-41.0	5.6-7.3	---
	12-22	28-48	36.0-41.0	5.1-6.0	---
	22-42	40-50	36.0-41.0	5.1-6.0	---
	42-60	28-40	36.0-41.0	6.1-7.3	---
364B:					
Grundy-----	0-15	28-35	30.0-36.0	5.6-7.3	---
	15-19	32-45	16.0-24.0	5.6-6.5	---
	19-42	40-50	20.0-26.0	5.1-7.3	---
	42-60	28-35	14.0-19.0	5.6-7.3	---
364B2:					
Grundy-----	0-10	28-35	30.0-36.0	5.6-7.3	---
	10-15	32-45	16.0-24.0	5.6-6.5	---
	15-38	40-50	20.0-26.0	5.1-7.3	---
	38-60	28-35	14.0-19.0	5.6-7.3	---
423D2:					
Bucknell-----	0-6	27-38	20.0-25.0	5.6-7.3	---
	6-50	38-50	36.0-41.0	4.5-6.0	---
	50-60	30-40	30.0-36.0	5.6-7.3	---
424D2:					
Lindley-----	0-9	18-27	10.0-16.0	4.5-7.3	---
	9-43	25-35	15.0-20.0	4.5-6.5	---
	43-60	18-32	10.0-16.0	6.1-7.8	---
Keswick-----	0-10	22-27	20.0-25.0	4.5-7.3	---
	10-29	35-60	30.0-50.0	4.5-6.0	---
	29-60	30-40	30.0-36.0	4.5-7.8	0-15
424E2:					
Lindley-----	0-8	18-27	10.0-16.0	4.5-7.3	---
	8-42	25-35	15.0-20.0	4.5-6.5	---
	42-60	18-32	10.0-16.0	6.1-7.8	---
Keswick-----	0-9	22-27	20.0-25.0	4.5-7.3	---
	9-27	35-60	30.0-50.0	4.5-6.0	---
	27-60	30-40	30.0-36.0	4.5-7.8	0-15

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
425D1: Keswick-----	0-12	22-27	20.0-25.0	4.5-7.3	---
	12-31	35-60	30.0-50.0	4.5-6.0	---
	31-60	30-40	30.0-36.0	4.5-7.8	0-15
425D2: Keswick-----	0-10	27-40	25.0-30.0	4.5-7.3	---
	10-29	35-60	30.0-50.0	4.5-6.0	---
	29-60	30-40	30.0-36.0	4.5-7.8	0-15
430: Ackmore-----	0-8	18-27	25.0-30.0	5.6-7.3	---
	8-27	18-30	25.0-30.0	5.6-7.3	---
	27-60	26-38	25.0-30.0	5.6-7.8	5-10
453: Tuskeego-----	0-14	16-22	20.0-25.0	5.1-7.3	---
	14-46	18-30	20.0-25.0	5.1-6.5	---
	46-60	32-48	30.0-36.0	5.1-6.5	---
499G: Nordness-----	0-4	18-24	15.0-20.0	5.6-7.3	---
	4-11	22-29	15.0-20.0	5.6-7.3	---
	11-17	22-35	20.0-25.0	6.6-7.3	---
	17-60	---	---	---	---
520: Coppock-----	0-9	16-26	20.0-25.0	6.1-7.3	---
	9-29	16-27	20.0-25.0	5.6-7.3	---
	29-53	25-35	20.0-25.0	4.5-6.0	---
	53-60	24-40	20.0-25.0	4.5-6.0	---
520B1: Coppock-----	0-9	16-26	20.0-25.0	6.1-7.3	---
	9-29	16-27	20.0-25.0	5.6-7.3	---
	29-53	24-35	20.0-25.0	4.5-6.0	---
	53-60	24-40	20.0-25.0	4.5-6.0	---
570C2: Nira-----	0-11	28-34	25.0-30.0	5.6-7.3	---
	11-39	30-38	25.0-30.0	5.1-6.0	---
	39-60	24-34	25.0-30.0	5.6-6.5	---
571C2: Hedrick-----	0-7	27-34	20.0-25.0	5.6-7.3	---
	7-56	27-37	20.0-25.0	5.1-6.5	---
	56-60	24-32	20.0-25.0	5.6-7.8	---
572C2: Inton-----	0-7	27-35	30.0-35.0	5.1-7.3	---
	7-48	27-35	30.0-35.0	5.1-6.5	---
	48-60	25-32	20.0-25.0	5.1-7.3	---
572D2: Inton-----	0-5	27-35	30.0-35.0	5.1-7.3	---
	5-46	27-35	30.0-35.0	5.1-6.5	---
	46-60	25-32	20.0-25.0	5.1-7.3	---
587: Chequest-----	0-17	30-35	25.0-30.0	5.6-7.3	---
	17-60	35-42	25.0-30.0	5.1-6.0	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
594D2:					
Galland-----	0-7	27-35	25.0-30.0	5.6-7.3	---
	7-54	35-48	25.0-35.0	4.5-6.0	---
	54-60	10-45	10.0-35.0	6.1-6.5	---
729:					
Nodaway-----	0-7	18-27	20.0-25.0	6.1-7.3	---
	7-60	18-28	20.0-25.0	6.1-7.3	---
Coppock-----	0-9	16-26	20.0-25.0	6.1-7.3	---
	9-29	16-27	20.0-25.0	5.6-7.3	---
	29-53	25-35	20.0-25.0	4.5-6.0	---
	53-60	24-40	20.0-25.0	4.5-6.0	---
730B:					
Nodaway-----	0-7	18-27	20.0-25.0	6.1-7.3	---
	7-60	18-28	20.0-25.0	6.1-7.3	---
Coppock-----	0-9	16-26	20.0-25.0	6.1-7.3	---
	9-29	16-27	20.0-25.0	5.6-7.3	---
	29-53	24-35	20.0-25.0	4.5-6.0	---
	53-60	24-40	20.0-25.0	4.5-6.0	---
Cantril-----	0-13	14-27	15.0-20.0	5.1-7.3	---
	13-60	27-35	20.0-25.0	5.1-6.5	---
779:					
Kalona-----	0-20	36-39	41.0-50.0	5.6-7.3	---
	20-41	36-42	36.0-41.0	5.6-7.3	---
	41-60	26-34	20.0-25.0	6.1-7.8	0-15
792C2:					
Armstrong-----	0-7	35-42	30.0-35.0	5.6-7.3	---
	7-60	36-60	41.0-50.0	4.5-6.5	---
792D2:					
Armstrong-----	0-6	35-42	30.0-35.0	5.6-7.3	---
	6-60	36-60	41.0-50.0	4.5-6.5	---
795C2:					
Ashgrove-----	0-9	27-40	25.0-30.0	4.5-7.3	---
	9-18	35-45	30.0-35.0	4.5-6.5	---
	18-60	40-60	41.0-50.0	4.5-7.3	---
795D2:					
Ashgrove-----	0-7	27-40	25.0-30.0	4.5-7.3	---
	7-16	35-45	30.0-35.0	4.5-6.5	---
	16-60	40-60	41.0-50.0	4.5-7.3	---
822D2:					
Lamoni-----	0-12	27-40	25.0-30.0	5.5-7.3	---
	12-52	38-50	41.0-50.0	5.1-6.5	---
	52-60	32-40	25.0-30.0	5.6-7.3	---
831B:					
Pershing-----	0-15	20-27	20.0-25.0	4.5-7.3	---
	15-20	27-35	25.0-30.0	5.1-6.0	---
	20-54	35-48	30.0-36.0	5.1-6.0	---
	54-60	24-40	25.0-30.0	5.1-6.5	---

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate
	In	Pct	meq/100g	pH	Pct
831C2: Pershing-----	0-9	27-38	25.0-30.0	4.5-7.3	---
	9-12	27-35	25.0-30.0	5.1-6.0	---
	12-44	35-48	30.0-36.0	5.1-6.0	---
	44-60	24-40	25.0-30.0	5.1-6.5	---
832B: Weller-----	0-11	16-27	15.0-20.0	4.5-7.3	---
	11-37	28-48	30.0-35.0	4.5-6.0	---
	37-60	25-40	25.0-30.0	5.1-6.5	---
832C2: Weller-----	0-8	27-36	25.0-30.0	4.5-7.3	---
	8-32	28-48	30.0-35.0	4.5-6.0	---
	32-60	25-40	25.0-30.0	5.1-6.5	---
832D2: Weller-----	0-7	27-36	25.0-30.0	4.5-7.3	---
	7-31	28-48	30.0-35.0	4.5-6.0	---
	31-60	25-40	25.0-30.0	5.1-6.5	---
876B: Ladoga-----	0-13	18-27	20.0-25.0	6.1-7.3	---
	13-45	36-42	20.0-25.0	5.1-6.0	---
	45-60	24-32	20.0-25.0	5.1-6.5	---
876C2: Ladoga-----	0-11	27-35	20.0-30.0	6.1-7.3	---
	11-43	36-42	25.0-30.0	5.1-6.0	---
	43-60	24-32	20.0-25.0	5.1-6.5	---
880B: Clinton-----	0-10	16-26	15.0-20.0	5.1-7.3	---
	10-32	36-42	25.0-30.0	4.5-6.0	---
	32-60	24-35	20.0-25.0	6.1-6.5	---
880C2: Clinton-----	0-9	27-34	25.0-30.0	5.1-7.3	---
	9-27	36-42	25.0-30.0	4.5-6.0	---
	27-60	24-35	20.0-25.0	6.1-6.5	---
880D2: Clinton-----	0-8	27-34	25.0-30.0	5.1-7.3	---
	8-26	36-42	25.0-30.0	4.5-6.0	---
	26-60	24-35	20.0-25.0	6.1-6.5	---
977: Richwood-----	0-15	15-22	20.0-25.0	5.6-7.3	---
	15-60	18-30	4.0-25.0	5.6-7.3	---
993D2: Gara-----	0-7	27-35	25.0-30.0	5.6-7.3	---
	7-47	25-38	25.0-30.0	4.5-6.5	---
	47-60	24-38	25.0-30.0	5.6-8.4	0-25
Armstrong-----	0-6	22-27	20.0-25.0	5.6-7.3	---
	6-60	36-60	41.0-50.0	4.5-6.5	---
993E2: Gara-----	0-6	27-35	25.0-30.0	5.6-7.3	---
	46-60	24-38	25.0-30.0	5.6-8.4	0-25

Chemical Properties of the Soils--Continued

Map symbol and soil name	Depth	Clay	Cation- exchange capacity	Soil reaction	Calcium carbonate
	In Pct	Pct	meq/100g	pH	Pct
993E2:					
Armstrong-----	0-5	22-27	20.0-25.0	5.6-7.3	---
	5-60	36-60	41.0-50.0	4.5-6.5	---
994D2:					
Galland-----	0-7	22-27	20.0-25.0	5.6-7.3	---
	7-54	35-48	25.0-35.0	4.5-6.0	---
	54-60	10-45	10.0-35.0	6.1-6.5	---
Douds-----	0-8	20-27	15.0-20.0	5.1-7.3	---
	8-33	26-35	15.0-20.0	4.5-6.0	---
	33-60	5-30	5.0-20.0	5.1-6.0	---
994E2:					
Galland-----	0-8	22-27	20.0-25.0	5.6-7.3	---
	8-55	35-48	25.0-35.0	4.5-6.0	---
	55-60	10-45	10.0-35.0	6.1-6.5	---
Douds-----	0-12	20-27	15.0-20.0	5.1-7.3	---
	12-37	26-35	15.0-20.0	4.5-6.0	---
	37-60	5-30	5.0-20.0	5.1-6.0	---
1075B:					
Givin-----	0-10	18-26	20.0-25.0	5.6-7.3	---
	10-37	36-42	20.0-25.0	5.1-5.5	---
	37-60	27-34	20.0-25.0	5.1-6.0	---
1130:					
Belinda-----	0-7	16-22	20.0-25.0	5.6-7.3	---
	7-12	18-27	20.0-25.0	4.5-6.0	---
	12-41	28-52	30.0-36.0	4.5-6.5	---
	41-60	28-40	30.0-36.0	5.1-6.0	---
1260:					
Beckwith-----	0-5	16-22	15.0-20.0	4.5-7.3	---
	5-15	18-27	15.0-20.0	4.5-5.5	---
	15-31	40-52	36.0-41.0	5.1-6.0	---
	31-60	28-40	30.0-36.0	5.6-6.5	---
1715:					
Nodaway-----	0-7	18-27	20.0-25.0	6.1-7.3	---
	7-60	18-28	20.0-25.0	6.1-7.3	---
Vesser-----	0-10	20-26	25.0-30.0	5.6-7.3	---
	10-25	18-22	20.0-25.0	5.1-6.0	---
	25-60	30-35	25.0-30.0	5.1-6.5	---
Ackmore-----	0-8	18-27	25.0-30.0	5.6-7.3	---
	8-27	18-30	25.0-30.0	5.6-7.3	---
	27-60	26-38	25.0-30.0	5.6-7.8	5-10
5020:					
Pits and Dumps--	0-60	---	---	---	---
5030:					
Pits-----	0-60	---	---	---	---
5040:					
Orthents-----	0-60	2-18	---	---	---
	60-80	---	---	---	---

Water Features

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					<u>Ft</u>				<u>Ft</u>
13B:									
Olmitz-----	B	None	---	---	>6.0	---	---	---	---
Vesser-----	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
Zook-----	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
23C2:									
Arispe-----	C	None	---	---	2.0-4.0	Perched	Nov-Jul	---	---
24D2:									
Shelby-----	B	None	---	---	>6.0	---	---	---	---
41B:									
Sparta-----	A	None	---	---	>6.0	---	---	---	---
51:									
Vesser-----	C	Occasional	Brief	Feb-Nov	0.0-1.0	Apparent	Nov-Jul	---	---
51B:									
Vesser-----	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
54:									
Zook-----	C/D	Occasional	Long	Feb-Nov	0.0-1.0	Apparent	Nov-Jul	---	---
65D2, 65E, 65E2, 65F2, 65G:									
Lindley-----	C	None	---	---	>6.0	---	---	---	---
74:									
Rubio-----	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
75, 75B:									
Givin-----	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
76B, 76C2, 76D2:									
Ladoga-----	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
80B, 80C2, 80D2:									
Clinton-----	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
87B:									
Colo-----	B	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
Zook-----	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
122:									
Sperry-----	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jul	Long	1.0
130:									
Belinda-----	D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
131B, 131B2, 131C2:									
Pershing-----	C	None	---	---	2.0-4.0	Perched	Nov-Jul	---	---
132B, 132C, 132C2, 132D, 132D2:									
Weller-----	C	None	---	---	2.0-4.0	Perched	Nov-Jul	---	---
139:									
Perks-----	A	Occasional	Brief	Feb-Nov	>6.0	---	---	---	---

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth Ft	Kind of water table	Months	Ponding duration	Maximum ponding depth Ft
179D2, 179E2: Gara-----	C	None	---	---	>6.0	---	---	---	---
180, 180B: Koomah-----	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
208: Klum-----	B	Occasional	Brief	Mar-Nov	3.0-6.0	Apparent	Nov-Jul	---	---
211: Edina-----	D	None	---	---	0.5-1.0	Apparent	Nov-Jul	---	---
220: Nodaway-----	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	---	---
222C, 222C2: Clarinda-----	D	None	---	---	0.0-1.0	Perched	Nov-Jul	---	---
223C2: Rinda-----	D	None	---	---	0.0-1.0	Perched	Nov-Jul	---	---
260: Beckwith-----	D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
263: Okaw-----	D	Rare	---	---	0.0-1.0	Apparent	Nov-Jul	Brief	0.5
264B: Ainsworth-----	B	None	---	---	>6.0	---	---	---	---
273B: Olmitz-----	B	None	---	---	>6.0	---	---	---	---
279: Taintor-----	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
280, 280B: Mahaska-----	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
281B, 281B2, 281C, 281C2: Otley-----	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
293C, 293F: Chelsea-----	A	None	---	---	>6.0	---	---	---	---
Fayette-----	B	None	---	---	>6.0	---	---	---	---
313E2, 313G: Gosport-----	C	None	---	---	1.5-3.0	Perched	Nov-Jul	---	---
315: Nodaway-----	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	---	---
Klum-----	B	Occasional	Brief	Mar-Nov	3.0-6.0	Apparent	Nov-Jul	---	---
Perks-----	A	Occasional	Brief	Feb-Nov	>6.0	---	---	---	---
362, 363: Haig-----	C/D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
364B, 364B2: Grundy-----	C	None	---	---	1.5-3.0	Perched	Nov-Jul	---	---

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth	Kind of water table	Months	Ponding duration	Maximum ponding depth
					<u>Ft</u>				<u>Ft</u>
423D2: Bucknell-----	D	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
424D2, 424E2: Lindley-----	C	None	---	---	>6.0	---	---	---	---
Keswick-----	C	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
425D, 425D2: Keswick-----	C	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
430: Ackmore-----	B	Occasional	Brief	Sep-Jun	1.0-3.0	Apparent	Nov-Jul	---	---
453: Tuskeego-----	C/D	Rare	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
499G: Nordness-----	B	None	---	---	>6.0	---	---	---	---
520: Coppock-----	B	Occasional	Brief	Feb-Nov	0.0-1.0	Apparent	Nov-Jul	---	---
520B: Coppock-----	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
570C2: Nira-----	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
571C2: Hedrick-----	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
572C2, 572D2: Inton-----	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
587: Chequest-----	C	Occasional	Long	Feb-Nov	0.0-1.0	Apparent	Nov-Jul	---	---
594D2: Galland-----	D	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
729: Nodaway-----	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	---	---
Coppock-----	B	Occasional	Brief	Feb-Nov	0.0-1.0	Apparent	Nov-Jul	---	---
730B: Nodaway-----	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	---	---
Coppock-----	B	None	---	---	1.0-3.0	Apparent	Nov-Jul	---	---
Cantril-----	B	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
779: Kalona-----	C	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
792C2, 792D2: Armstrong-----	C	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
795C2, 795D2: Ashgrove-----	D	None	---	---	0.0-1.0	Perched	Nov-Jul	---	---

Water Features--Continued

Map symbol and soil name	Hydro- logic group	Flooding			High water table and ponding				
		Frequency	Duration	Months	Water table depth <u>Ft</u>	Kind of water table	Months	Ponding duration	Maximum ponding depth <u>Ft</u>
822D2: Lamoni-----	C	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
831B, 831C2: Pershing-----	C	None	---	---	2.0-4.0	Perched	Nov-Jul	---	---
832B, 832C2, 832D2: Weller-----	C	None	---	---	2.0-4.0	Perched	Nov-Jul	---	---
876B, 876C2: Ladoga-----	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
880B, 880C2, 880D2: Clinton-----	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
977: Richwood-----	B	None	---	---	>6.0	---	---	---	---
993D2, 993E2: Gara-----	C	None	---	---	>6.0	---	---	---	---
Armstrong-----	C	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
994D2, 994E2: Galland-----	D	None	---	---	1.0-3.0	Perched	Nov-Jul	---	---
Douds-----	B	None	---	---	4.0-6.0	Apparent	Nov-Jul	---	---
1075B: Oivin-----	C	None	---	---	2.0-4.0	Apparent	Nov-Jul	---	---
1130: Belinda-----	D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
1260: Beckwith-----	D	None	---	---	0.0-1.0	Apparent	Nov-Jul	---	---
1715: Nodaway-----	B	Occasional	Brief	Feb-Nov	3.0-5.0	Apparent	Nov-Jul	---	---
Vesser-----	C	Occasional	Brief	Feb-Nov	0.0-1.0	Apparent	Nov-Jul	---	---
Ackmore-----	B	Occasional	Brief	Sep-Jun	1.0-3.0	Apparent	Nov-Jul	---	---
5020: Pits and Dumps--	A	None	---	---	>6.0	---	---	---	---
5030: Pits-----	A	None	---	---	>6.0	---	---	---	---
5040: Orthents-----	B	None	---	---	>6.0	---	---	---	---

Soil Features

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
13B:					
Olmitz-----	>60	---	Moderate	Moderate	Moderate.
Vesser-----	>60	---	High	High	Moderate.
Zook-----	>60	---	High	High	Moderate.
23C2:					
Arispe-----	>60	---	High	High	Moderate.
24D2:					
Shelby-----	>60	---	Moderate	Moderate	Moderate.
41B:					
Sparta-----	>60	---	Low	Low	Moderate.
51, 51B:					
Vesser-----	>60	---	High	High	Moderate.
54:					
Zook-----	>60	---	High	High	Moderate.
65D2, 65E, 65E2, 65F2, 65G:					
Lindley-----	>60	---	Moderate	Moderate	Moderate.
74:					
Rubio-----	>60	---	High	High	Moderate.
75, 75B:					
Givin-----	>60	---	High	High	Moderate.
76B, 76C2, 76D2:					
Ladoga-----	>60	---	Moderate	Moderate	Moderate.
80B, 80C2, 80D2:					
Clinton-----	>60	---	Moderate	Moderate	Moderate.
87B:					
Colo-----	>60	---	High	High	Moderate.
Zook-----	>60	---	High	High	Moderate.
122:					
Sperry-----	>60	---	High	High	Moderate.
130:					
Belinda-----	>60	---	Moderate	High	Moderate.
131B, 131B2, 131C2:					
Pershing-----	>60	---	High	High	Moderate.
132B, 132C, 132C2, 132D, 132D2:					
Weller-----	>60	---	High	High	High.
139:					
Perks-----	>60	---	Low	Low	Moderate.
179D2, 179E2:					
Gara-----	>60	---	Moderate	Moderate	Moderate.

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
180, 180B: Keomah-----	>60	---	High	High	Moderate.
208: Klum-----	>60	---	Moderate	Low	Low.
211: Edina-----	>60	---	Moderate	High	Moderate.
220: Nodaway-----	>60	---	High	Moderate	Low.
222C, 222C2: Clarinda-----	>60	---	High	High	Moderate.
223C2: Rinda-----	>60	---	High	High	Moderate.
260: Beckwith-----	>60	---	Moderate	High	Moderate.
263: Okaw-----	>60	---	High	High	High.
264B: Ainsworth-----	>60	---	High	Moderate	Moderate.
273B: Olmitz-----	>60	---	Moderate	Moderate	Moderate.
279: Taintor-----	>60	---	High	High	Moderate.
280, 280B: Mahaska-----	>60	---	High	High	Moderate.
281B, 281B2, 281C, 281C2: Otley-----	>60	---	Moderate	Moderate	Moderate.
293C, 293F: Chelsea-----	>60	---	Low	Low	Low.
Fayette-----	>60	---	High	Moderate	Moderate.
313E2, 313G: Gosport-----	20-40	Soft	Moderate	High	High.
315: Nodaway-----	>60	---	High	Moderate	Low.
Klum-----	>60	---	Moderate	Low	Low.
Perks-----	>60	---	Low	Low	Moderate.
362, 363: Haig-----	>60	---	High	High	Moderate.
364B, 364B2: Grundy-----	>60	---	High	High	Moderate.
423D2: Bucknell-----	>60	---	Moderate	High	Moderate.

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
424D2, 424E2: Lindley-----	>60	---	Moderate	Moderate	Moderate.
Keswick-----	>60	---	High	High	Moderate.
425D, 425D2: Keswick-----	>60	---	High	High	Moderate.
430: Ackmore-----	>60	---	High	High	Low.
453: Tuskeego-----	>60	---	Moderate	High	Moderate.
499G: Nordness-----	8-20	Hard	Low	Low	Low.
520, 520B: Coppock-----	>60	---	High	High	Moderate.
570C2: Nira-----	>60	---	High	Moderate	Moderate.
571C2: Hedrick-----	>60	---	High	Moderate	Moderate.
572C2, 572D2: Inton-----	>60	---	High	Moderate	Moderate.
587: Chequest-----	>60	---	High	High	Moderate.
594D2: Galland-----	>60	---	High	High	Moderate.
729: Nodaway-----	>60	---	High	Moderate	Low.
Coppock-----	>60	---	High	High	Moderate.
730B: Nodaway-----	>60	---	High	Moderate	Low.
Coppock-----	>60	---	High	High	Moderate.
Cantril-----	>60	---	High	Moderate	Low.
779: Kalona-----	>60	---	High	High	Moderate.
792C2, 792D2: Armstrong-----	>60	---	High	High	Moderate.
795C2, 795D2: Ashgrove-----	>60	---	High	High	Moderate.
822D2: Lamoni-----	>60	---	Moderate	High	Moderate.
831B, 831C2: Pershing-----	>60	---	High	High	Moderate.

Soil Features--Continued

Map symbol and soil name	Bedrock		Potential frost action	Risk of corrosion	
	Depth	Hardness		Uncoated steel	Concrete
	In				
832B, 832C2, 832D2: Weller-----	>60	---	High	High	High.
876B, 876C2: Ladoga-----	>60	---	Moderate	Moderate	Moderate.
880B, 880C2, 880D2: Clinton-----	>60	---	Moderate	Moderate	Moderate.
977: Richwood-----	>60	---	High	Low	Low.
993D2, 993E2: Qara-----	>60	---	Moderate	Moderate	Moderate.
Armstrong-----	>60	---	High	High	Moderate.
994D2, 994E2: Galland-----	>60	---	High	High	Moderate.
Douds-----	>60	---	Moderate	Moderate	Moderate.
1075B: Givin-----	>60	---	High	High	Moderate.
1130: Belinda-----	>60	---	Moderate	High	Moderate.
1260: Beckwith-----	>60	---	Moderate	High	Moderate.
1715: Nodaway-----	>60	---	High	Moderate	Low.
Vesser-----	>60	---	High	High	Moderate.
Ackmore-----	>60	---	High	High	Low.
5020: Pits and Dumps--	0-4	Hard	---	---	---
5030: Pits-----	0-4	Hard	---	---	---
5040: Orthents.					

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The geomorphic component that forms

the steepest inclined surface and principal element of many hillslopes (fig. 5). Backslopes in profile are commonly steep and linear and descend to a footslope. In terms of gradational process, backslopes are erosional forms produced mainly by mass wasting and running water.

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Base slope. A geomorphic component of hills. It consists of a concave surface at the bottom of hillslopes that is underlain by colluvial and slope-wash materials or forms a colluvial apron or wedge; a three-dimensional analog of a footslope. Distal base slope sediments commonly grade into, interfinger with, or are buried by alluvial fills.

Beach deposits. Material, such as sand and gravel, that is generally laid down parallel to an active or relict shoreline of a postglacial or glacial lake.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor

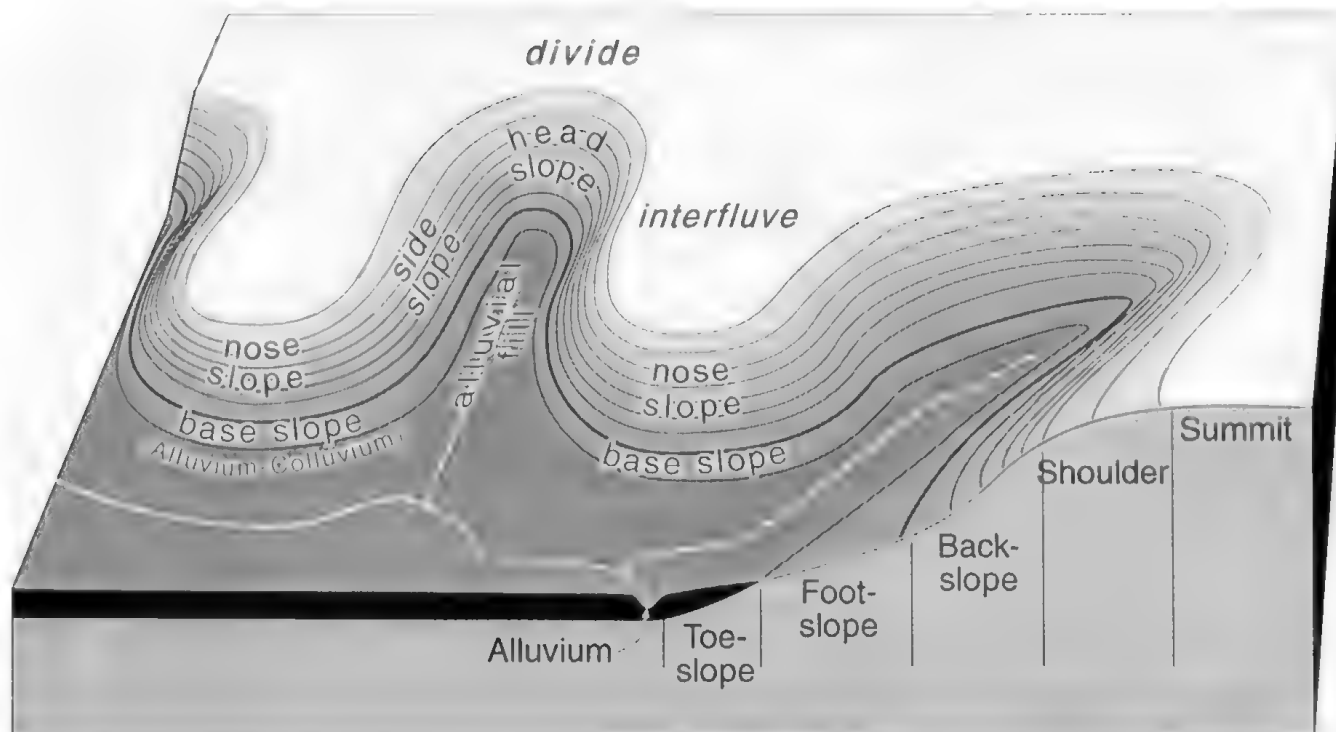


Figure 5.—Landscape relationship of geomorphic components and hillslope positions (modified after Ruhe and Walker, 1968).

formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Brush management. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channery soil material. Soil material that is, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a chanter.

Chemical treatment. Control of unwanted vegetation through the use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay depletions. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the site is properly managed.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvium. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is

unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Conservation tillage. Any tillage and planting system in which a cover of crop residue is maintained on at least 30 percent of the surface after planting in order to reduce the hazard of water erosion; in areas where wind erosion is the primary concern, a system that maintains a cover of at least 1,000 pounds of flat residue of small grain or its equivalent during the critical erosion period.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—Readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—Adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming).

Growing crops in strips that follow the contour.

Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cropping system. Growing crops according to a planned system of rotation and management practices.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Delta. A body of alluvium having a surface that is nearly flat and fan shaped; deposited at or near the mouth of a river or stream where it enters a body of relatively quiet water, generally a sea or lake.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth, soil. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Divide. (a) The line of separation, or (b) the summit area, or narrow tract of higher ground that constitutes the watershed boundary between two adjacent drainage basins; it divides the surface waters that flow naturally in one direction from those that flow in the opposite direction.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of

artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—These soils have very high and high hydraulic conductivity and a low water-holding capacity. They are not suited to crop production unless irrigated.

Somewhat excessively drained.—These soils have high hydraulic conductivity and a low water-holding capacity. Without irrigation, only a narrow range of crops can be grown and yields are low.

Well drained.—These soils have an intermediate or high water-holding capacity. They retain optimum amounts of moisture, but they are not wet close enough to the surface or long enough during the growing season to adversely affect yields.

Moderately well drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or yields of most field crops are affected. Moderately well drained soils commonly have a layer with low hydraulic conductivity, a wet layer relatively high in the profile, additions of water by seepage, or some combination of these.

Somewhat poorly drained.—These soils are wet close enough to the surface or long enough that planting or harvesting operations or crop growth is markedly restricted under natural conditions. Somewhat poorly drained soils commonly have a layer with low hydraulic conductivity, a wet layer high in the profile, additions of water through seepage, or a combination of these.

Poorly drained.—These soils commonly are so wet at or near the surface during a considerable part of the year that field crops cannot be grown under natural conditions. Poor drainage is caused by a saturated zone, a layer with low hydraulic conductivity, seepage, or a combination of these.

Very poorly drained.—These soils are wet to the surface most of the time. The wetness prevents the growth of important crops (except for rice) under natural conditions.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Duff. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and

includes everything from the litter on the surface to underlying pure humus.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Endosaturation. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Ephemeral stream. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.

Episaturation. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. The term is more often applied to cliffs resulting from differential erosion.

Esker. A long, narrow, sinuous, steep-sided ridge composed of irregularly stratified sand and gravel that were deposited by a subsurface stream flowing between ice walls or through ice tunnels of a retreating glacier and that were left behind when the ice melted. Eskers range from less than 1 mile to more than 100 miles in length and from 10 to 100 feet in height.

Excess fines (in tables). Excess silt and clay in the

soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the oven-dry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity*, *normal moisture capacity*, or *capillary capacity*.

Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. An area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flaggy soil material. Material that is, by volume, 15 to 35 percent flagstones. Very flaggy soil material is 35 to 60 percent flagstones, and extremely flaggy soil material is more than 60 percent flagstones.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to inundation under flood-stage conditions unless protected artificially. It is generally a constructional landform consisting of sediment deposited during overflow and lateral migration of the stream.

Footslope. The geomorphic component that forms

the inner, gently inclined surface at the base of a hillslope. The surface is dominantly concave. In terms of gradational processes, a footslope is a transition zone between an upslope site of erosion (backslope) and a downslope site of deposition (toeslope).

Forb. Any herbaceous plant not a grass or a sedge.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Geomorphology. The science that treats the general configuration of the earth's surface; specifically the study of the classification, description, nature, origin, and development of landforms and their relationships to underlying structures, and the history of geologic changes as recorded by these surface features. The term is especially applied to the genetic interpretation of landforms.

Glacial drift. Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash. Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glaciofluvial deposits. Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial

meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water. Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard bedrock. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Head slope. The concave surface at the head of a drainageway where the flow of water converges downward toward the center and contour lines form concave curves.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric material and the more decomposed sapric material.

High-chroma zones. Zones having chroma of 3 or more. Typical color in areas of iron concentrations.

High-residue crops. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 6 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the

inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Ice-walled lake plain. A relict surface marking the floor of an extinct lake basin that was formed on solid ground and surrounded by stagnant ice in a stable or unstable superglacial environment on stagnation moraines. As the ice melted the lake plain became perched above the adjacent landscape. The lake plain is well sorted, generally fine textured, stratified deposits.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not

a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Interfluvium. A landform composed of the relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. An elevated area between two drainageways that sheds water to those drainageways.

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Iron concentrations. High-chroma zones having a high content of iron and manganese oxide because of chemical oxidation and accumulation, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic concentration.

Iron depletions. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made

by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame. A moundlike hill of glacial drift, composed chiefly of stratified sand and gravel.

Kame moraine. An end moraine that contains numerous kames. A group of kames along the front of a stagnant glacier, commonly comprising the slumped remnants of a formerly continuous outwash plain built up over the foot of rapidly wasting or stagnant ice.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Lake bed. The bottom of a lake; a lake basin.

Lake plain. A nearly level surface marking the floor of an extinct lake filled by well sorted, generally fine textured, stratified deposits, commonly containing varves.

Lakeshore. A narrow strip of land in contact with or bordering a lake; especially the beach of a lake.

Lake terrace. A narrow shelf, partly cut and partly built, produced along a lakeshore in front of a scarp line of low cliffs and later exposed when the water level falls.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-chroma zones. Zones having chroma of 2 or less. Typical color in areas of iron depletions.

Low-residue crops. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Moraine. An accumulation of glacial drift in a topographic landform resulting chiefly from the direct action of glacial ice. Some types are lateral, recessional, and terminal.

Morphology, soil. The physical makeup of the soil,

including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—*few*, *common*, and *many*; size—*fine*, *medium*, and *coarse*; and contrast—*faint*, *distinct*, and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nodules. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.

Nose slope. The projecting end of an interfluvium, where contour lines connecting the opposing side slopes form convex curves around the projecting end and lines perpendicular to the contours diverge downward. Overland flow of water is divergent.

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
Moderately low	1.0 to 2.0 percent

Moderate	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

Outwash plain. An extensive area of glaciofluvial material that was deposited by meltwater streams.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Parts per million (ppm). The concentration of a substance in the soil, such as phosphorus or potassium, in one million parts of air-dried soil on a weight per weight basis.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedisediment. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affects the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Extremely slow	less than 0.01 inch
Very slow	0.01 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and thickness.

Phosphorus. The amount of phosphorus available to plants at a depth of 30 to 42 inches is expressed in parts per million and based on the weighted

average of air-dried soil samples. Terms describing the amount of available phosphorus are:

Very low	less than 7.5 ppm
Low	7.5 to 13.0 ppm
Medium	13.0 to 22.5 ppm
High	more than 22.5 ppm

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitted outwash plain. An outwash plain marked by many irregular depressions, such as kettles, shallow pits, and potholes, which formed by melting of incorporated ice masses; many are found in Wisconsin and Minnesota.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid or very rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potassium. The amount of potassium available to plants at a depth of 12 to 24 inches is expressed in parts per million and based on the weighted average of air-dried soil samples. Terms describing the amount of available potassium are:

Very low	less than 50 ppm
Low	50 to 79 ppm

Medium 79 to 125 ppm

High more than 125 ppm

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth).

Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Burning an area under conditions of weather and soil moisture and at the time of day that will result in the intensity of heat and spread required to accomplish specific forest management, wildlife, grazing, or fire hazard reduction purposes.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	less than 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Redoximorphic concentrations. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.

Redoximorphic depletions. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.

Redoximorphic features. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha,alpha-dipyridyl, and other features

indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.

Reduced matrix. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs the growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck

has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Saprolite. Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Saturation. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.

Scarification. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The hillslope position that forms the uppermost inclined surface near the top of a hillslope. It comprises the transition zone from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. The slope bounding a drainageway and lying between the drainageway and the adjacent interfluvium. It is generally linear along the slope

width, and overland flow is parallel down the slope.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small

stones adversely affect the specified use of the soil.

Soft bedrock. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

Stagnation moraine. A body of drift released by the melting of a glacier that ceased flowing. Commonly but not always occurs near ice margins; composed of till, ice-contact stratified drift, and small areas of glacial lake sediment. Typical landforms are knob-and-kettle topography, locally including ice-walled lake plains.

Stone line. A concentration of rock fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide

vegetative barriers to wind erosion and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are: *platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter or loosen a layer that restricts roots.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. The topographically highest position of a hillslope profile and exhibiting a nearly level surface. A general term for the top, or highest level, of a landform such as a hill, mountain, or tableland. It usually refers to a high interfluvial area of gentler slope that is flanked by steeper hillslopes, for example, mountain fronts or tableland escarpments.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.

Swale. A slight depression in the midst of generally level land. A shallow depression in an undulating ground moraine due to uneven glacial deposition.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances. It commonly is a massive, arcuate ridge or complex of ridges underlain by till and other types of drift.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand*, *loamy sand*, *sandy loam*, *loam*, *silt loam*, *silt*, *sandy clay loam*, *clay loam*, *silty clay loam*, *sandy clay*, *silty clay*, and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till. Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Till plain. An extensive area of nearly level to undulating or gently sloping soils that are underlain by till or consist of till. Slopes are 0 to 6 percent.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The outermost inclined surface at the base of a hill. Toeslopes are commonly gentle and linear in profile.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as salts, that severely hinder

establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

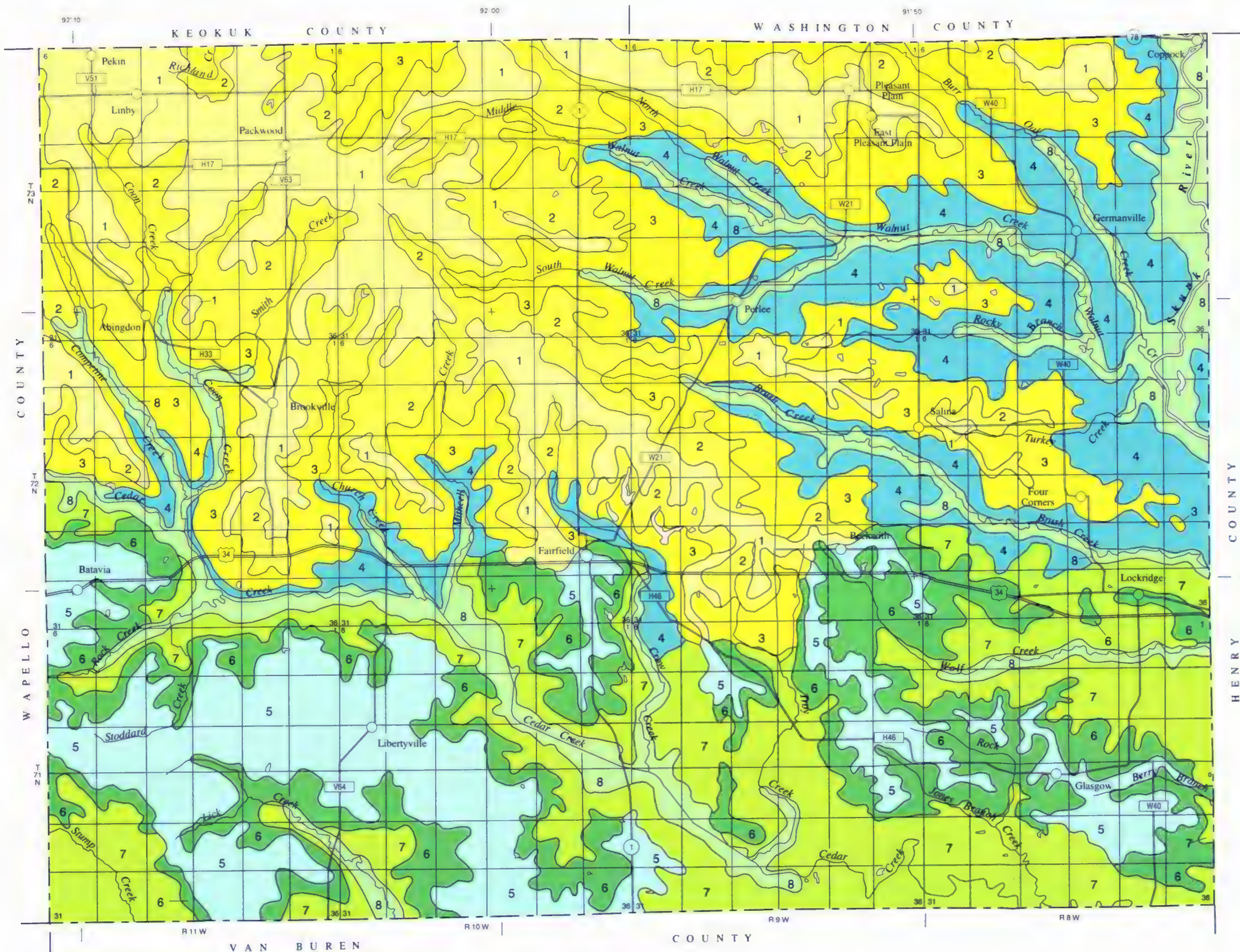
Wilting point (or permanent wilting point). The moisture content of soil, on an oven-dry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Windthrow. The uprooting and tipping over of trees by the wind.

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SOIL LEGEND*

- 1 Taintor-Mahaska-Otley association
- 2 Mahaska-Otley-Nira association
- 3 Ladoga-Hedrick-Gara association
- 4 Clinton-Lindley-Ashgrove association
- 5 Haig-Grundy-Clarinda association
- 6 Pershing-Lindley-Rinda association
- 7 Weller-Lindley association
- 8 Nodaway-Coppock association

*The units on this legend are described in the text under the heading "General Soil Map Units."

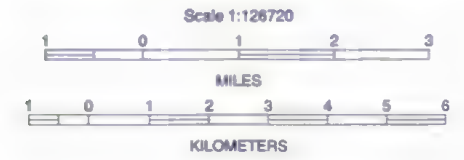
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SECTIONALIZED TOWNSHIP

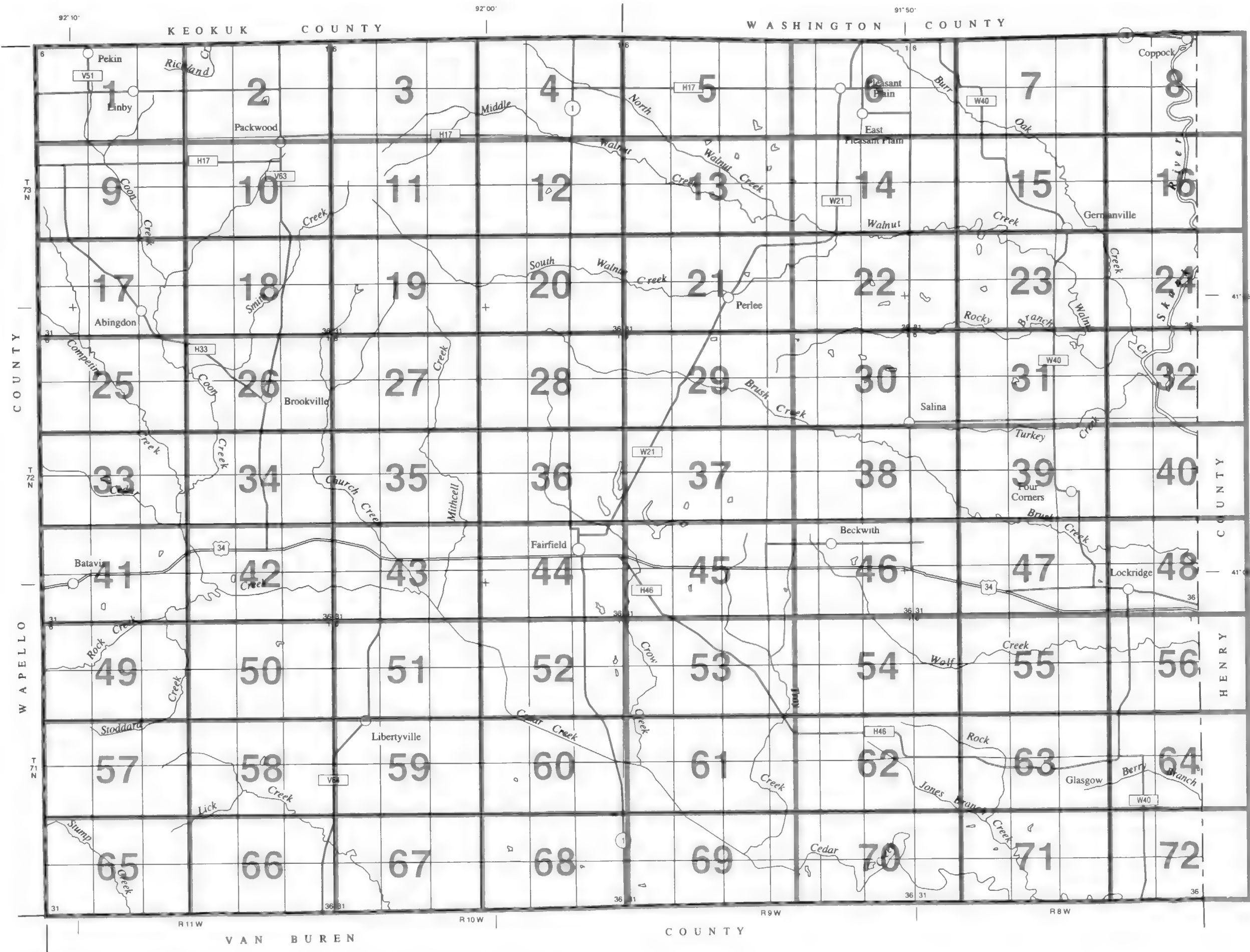
6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
in cooperation with
IOWA AGRICULTURE AND HOME ECONOMICS EXPERIMENT STATION
COOPERATIVE EXTENSION SERVICE,
IOWA STATE UNIVERSITY, and the
DIVISION OF SOIL CONSERVATION,
IOWA DEPARTMENT OF AGRICULTURE
and LAND STEWARDSHIP

GENERAL SOIL MAP JEFFERSON COUNTY, IOWA



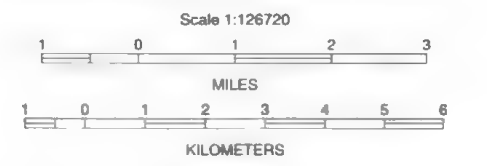
Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



SECTIONALIZED
TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS
JEFFERSON COUNTY, IOWA



SOIL LEGEND

Map symbols consist of numbers or a combination of numbers and a letter. The initial numbers represent the kind of soil. A capital letter following these numbers indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 following the slope letter indicates that the soil is moderately eroded.

SYMBOL	NAME	SYMBOL	NAME
13B	Olmitz-Vesser-Zook complex, 0 to 5 percent slopes	293F	Chelsea-Fayette complex, 18 to 25 percent slopes
23C2	Arispe silty clay loam, 5 to 9 percent slopes, moderately eroded	313E2	Gosport silty clay loam, 14 to 18 percent slopes, moderately eroded
24D2	Shelby clay loam, 9 to 14 percent slopes, moderately eroded	313G	Gosport silty clay loam, 25 to 40 percent slopes
41B	Sparta loamy fine sand, 2 to 5 percent slopes	315	Nodaway-Klum-Perks complex, 0 to 3 percent slopes
51	Vesser silt loam, 0 to 2 percent slopes	362	Haig silt loam, 0 to 2 percent slopes
51B	Vesser silt loam, 2 to 5 percent slopes	363	Haig silty clay loam, 0 to 1 percent slopes
54	Zook silty clay loam, 0 to 2 percent slopes	364B	Grundy silty clay loam, 2 to 5 percent slopes
65D2	Lindley loam, 9 to 14 percent slopes, moderately eroded	364B2	Grundy silty clay loam, 2 to 5 percent slopes, moderately eroded
65E	Lindley loam, 14 to 18 percent slopes	423D2	Bucknell silty clay loam, 9 to 14 percent slopes, moderately eroded
65E2	Lindley loam, 14 to 18 percent slopes, moderately eroded	424D2	Lindley-Keswick complex, 9 to 14 percent slopes, moderately eroded
65F2	Lindley loam, 18 to 25 percent slopes, moderately eroded	424E2	Lindley-Keswick complex, 14 to 18 percent slopes, moderately eroded
65G	Lindley loam, 25 to 40 percent slopes	425D	Keswick loam, 9 to 14 percent slopes
74	Rubio silt loam, 0 to 2 percent slopes	425D2	Keswick clay loam, 9 to 14 percent slopes, moderately eroded
75	Givin silt loam, 0 to 2 percent slopes	430	Ackmore silt loam, 0 to 2 percent slopes
75B	Givin silt loam, 2 to 5 percent slopes	453	Tuskeego silt loam, 0 to 2 percent slopes
76B	Ladoga silt loam, 2 to 5 percent slopes	499G	Nordness silt loam, 25 to 40 percent slopes
76C2	Ladoga silty clay loam, 5 to 9 percent slopes, moderately eroded	520	Coppock silt loam, 0 to 2 percent slopes
76D2	Ladoga silty clay loam, 9 to 14 percent slopes, moderately eroded	520B	Coppock silt loam, 2 to 5 percent slopes
80B	Clinton silt loam, 2 to 5 percent slopes	570C2	Nira silty clay loam, 5 to 9 percent slopes, moderately eroded
80C2	Clinton silty clay loam, 5 to 9 percent slopes, moderately eroded	571C2	Hedrick silty clay loam, 5 to 9 percent slopes, moderately eroded
80D2	Clinton silty clay loam, 9 to 14 percent slopes, moderately eroded	572C2	Inton silty clay loam, 5 to 9 percent slopes, moderately eroded
87B	Colo-Zook complex, 0 to 5 percent slopes	572D2	Inton silty clay loam, 9 to 14 percent slopes, moderately eroded
122	Sperry silt loam, 0 to 1 percent slopes	58	Chequest silty clay loam, 0 to 2 percent slopes
130	Belinda silt loam, 0 to 2 percent slopes	594D2	Galland clay loam, 9 to 14 percent slopes, moderately eroded
131B	Pershing silt loam, 2 to 5 percent slopes	729	Nodaway-Coppock complex, 0 to 2 percent slopes
131B2	Pershing silty clay loam, 2 to 5 percent slopes, moderately eroded	730B	Nodaway-Coppock-Cantril complex, 2 to 5 percent slopes
131C2	Pershing silty clay loam, 5 to 9 percent slopes, moderately eroded	779	Kalona silty clay loam, 0 to 1 percent slopes
132B	Weller silt loam, 2 to 5 percent slopes	792C2	Armstrong clay loam, 5 to 9 percent slopes, moderately eroded
132C	Weller silt loam, 5 to 9 percent slopes	792D2	Armstrong clay loam, 9 to 14 percent slopes, moderately eroded
132C2	Weller silty clay loam, 5 to 9 percent slopes, moderately eroded	795C2	Ashgrove silty clay loam, 5 to 9 percent slopes, moderately eroded
132D	Weller silt loam, 9 to 14 percent slopes	795D2	Ashgrove silty clay loam, 9 to 14 percent slopes, moderately eroded
132D2	Weller silty clay loam, 9 to 14 percent slopes, moderately eroded	822D2	Lamoni silty clay loam, 9 to 14 percent slopes, moderately eroded
139	Perks loamy sand, 1 to 3 percent slopes	831B	Pershing silt loam, bench, 2 to 5 percent slopes
179D2	Gara clay loam, 9 to 14 percent slopes, moderately eroded	831C2	Pershing silty clay loam, bench, 5 to 9 percent slopes, moderately eroded
179E2	Gara clay loam, 14 to 18 percent slopes, moderately eroded	832B	Weller silt loam, bench, 2 to 5 percent slopes
180	Keomah silt loam, 0 to 2 percent slopes	832C2	Weller silty clay loam, bench, 5 to 9 percent slopes, moderately eroded
180B	Keomah silt loam, 2 to 5 percent slopes	832D2	Weller silty clay loam, bench, 9 to 14 percent slopes, moderately eroded
208	Klum fine sandy loam, 0 to 2 percent slopes	876B	Ladoga silt loam, bench, 2 to 5 percent slopes
211	Edina silt loam, depressional, 0 to 1 percent slopes	876C2	Ladoga silty clay loam, bench, 5 to 9 percent slopes, moderately eroded
220	Nodaway silt loam, 0 to 2 percent slopes	880B	Clinton silt loam, bench, 2 to 5 percent slopes
222C	Ciannda silty clay loam, 5 to 9 percent slopes	880C2	Clinton silty clay loam, bench, 5 to 9 percent slopes, moderately eroded
222C2	Ciannda silty clay loam, 5 to 9 percent slopes, moderately eroded	880D2	Clinton silty clay loam, bench, 9 to 14 percent slopes, moderately eroded
223C2	Rinda silty clay loam, 5 to 9 percent slopes, moderately eroded	977	Richwood silt loam, 0 to 2 percent slopes
260	Beckwith silt loam, 0 to 2 percent slopes	993D2	Gara-Armstrong complex, 9 to 14 percent slopes, moderately eroded
263	Okaw silt loam, 0 to 2 percent slopes	993E2	Gara-Armstrong complex, 14 to 18 percent slopes, moderately eroded
264B	Ainsworth silt loam, 2 to 5 percent slopes	994D2	Galland-Douds complex, 9 to 14 percent slopes, moderately eroded
273B	Olmitz loam, 2 to 5 percent slopes	994E2	Galland-Douds complex, 14 to 18 percent slopes, moderately eroded
279	Taintor silty clay loam, 0 to 2 percent slopes	1075B	Givin silt loam, bench, 2 to 5 percent slopes
280	Mahaska silty clay loam, 0 to 2 percent slopes	1130	Belinda silt loam, bench, 0 to 2 percent slopes
280B	Mahaska silty clay loam, 2 to 5 percent slopes	1260	Beckwith silt loam, bench, 0 to 2 percent slopes
281B	Otley silty clay loam, 2 to 5 percent slopes	1715	Nodaway-Vesser-Ackmore complex, 0 to 2 percent slopes
281B2	Otley silty clay loam, 2 to 5 percent slopes, moderately eroded	5020	Pits and Dumps
281C	Otley silty clay loam, 5 to 9 percent slopes	5030	Pits, limestone quarries
281C2	Otley silty clay loam, 5 to 9 percent slopes, moderately eroded	5040	Orthents, loamy
293C	Chelsea-Fayette complex, 5 to 9 percent slopes		

CONVENTIONAL AND SPECIAL
SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

County or parish

Reservation (national forest or park, state forest or park, and large airport)

Field sheet matchline and neatline

AD HOC BOUNDARY
(label)

Small airport, airfield, park, oilfield cemetery, or flood pool

STATE COORDINATE TICK
1 890 000 FEET
LAND DIVISION CORNER
(sections and land grants)

ROADS

Divided (median shown if scale permits)

Other roads

ROAD EMBLEM & DESIGNATIONS

Federal

State

RAILROAD

LEVEES

Without road

DAMS

Large (to scale)

Medium or Small
(Named where applicable)

PITS

Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

Farmstead, house (omit in urban area) (occupied)

Church

School

WATER FEATURES

DRAINAGE

Perennial, double line

Perennial, single line

Intermittent

Crossable with tillage implements

Not crossable with tillage implements

Drainage end

Canals or ditches

Drainage and or irrigation

LAKES, PONDS AND RESERVOIRS

Perennial

Intermittent

MISCELLANEOUS WATER FEATURES

Marsh or swamp

Wet spot

Sewage lagoon

SPECIAL SYMBOLS FOR
SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS

Bedrock (points down slope)

Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

SOIL SAMPLE (normally not shown)

MISCELLANEOUS
(each symbol represents 2 acres or less)

Gravelly spot

Dumps and other similar non soil areas

Rock outcrop (includes sandstone and shale)

Sandy spot

Severely eroded spot

Spot of Edina soil

Spot of Gosport soil

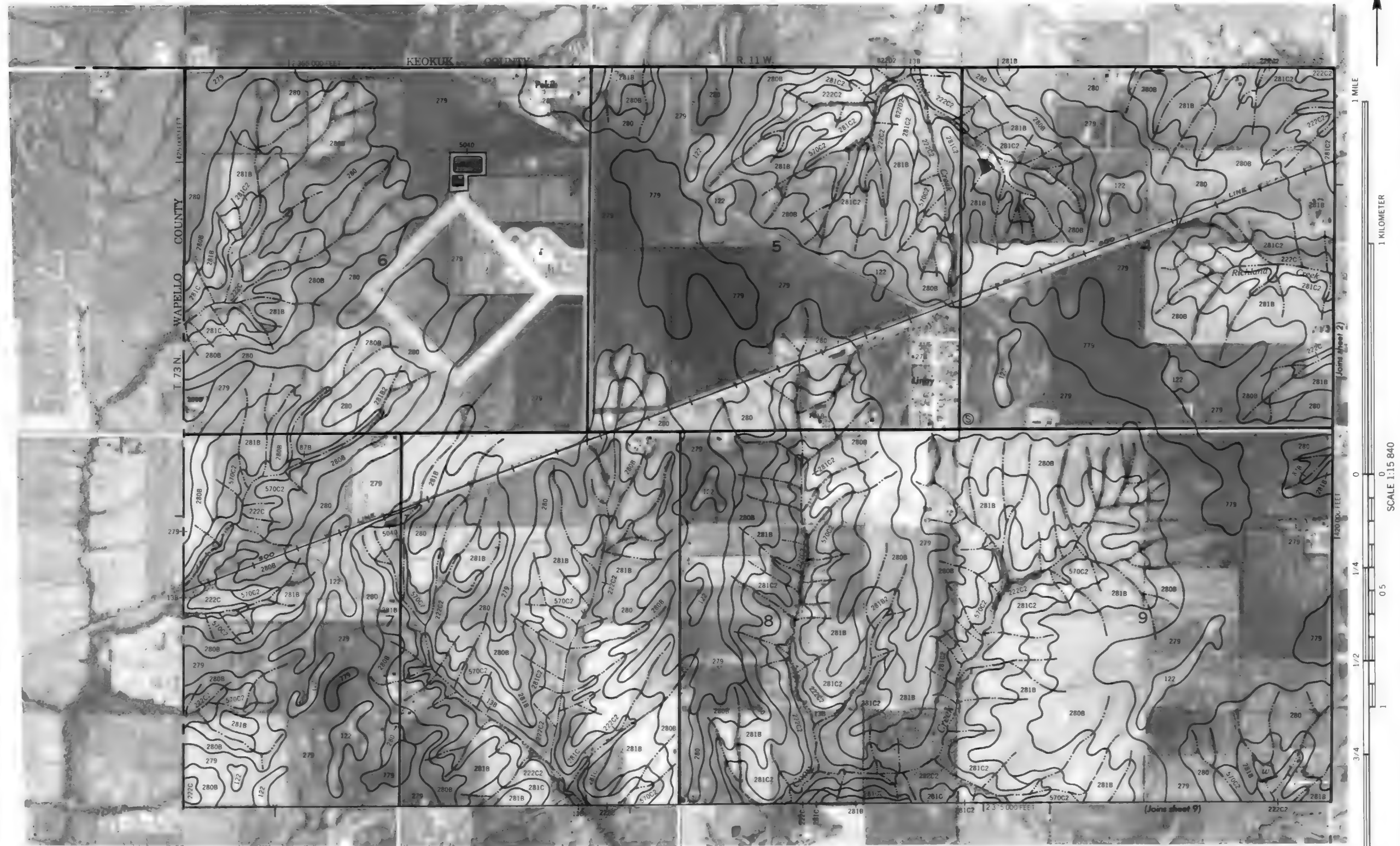
Spot of Sperry soil

Spot of red paleosol

Spot of gray paleosol

Spot of glacial till

JEFFERSON COUNTY, IOWA NO. 1



N

1 MILE

1 KILOMETER

SCALE 1 15 840

14

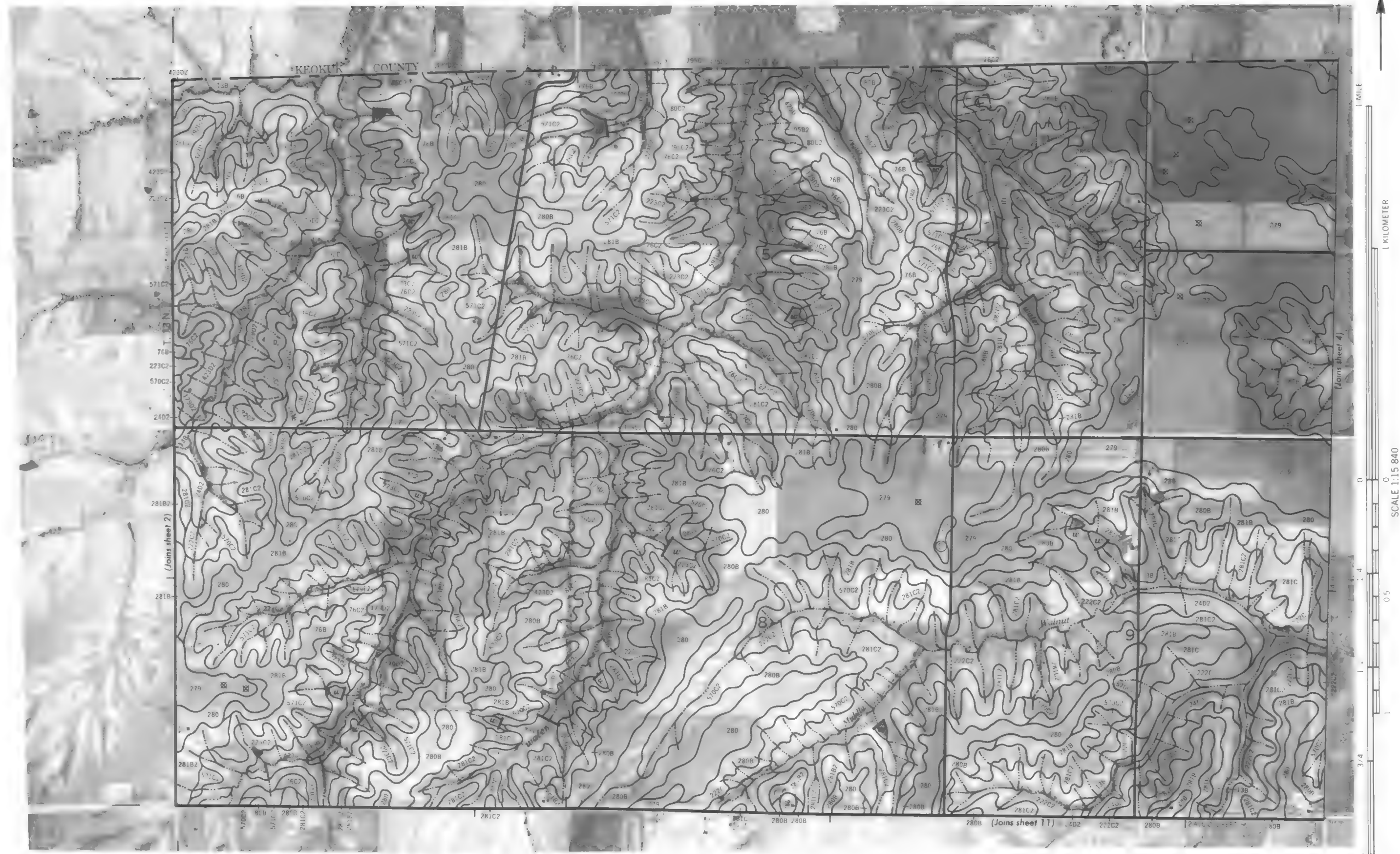
12

43



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

JEFFERSON COUNTY, IOWA NO. 3

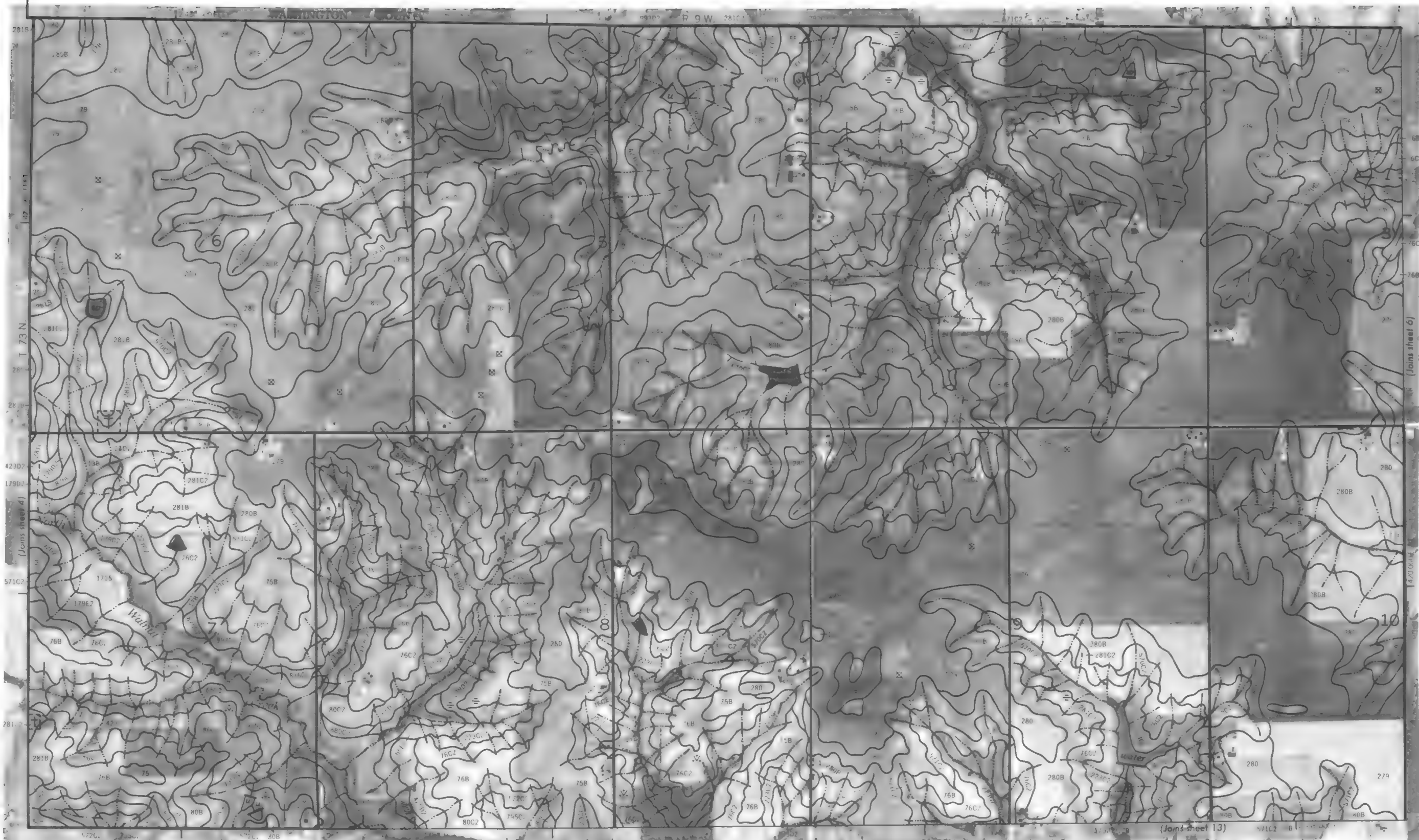






SCALE 1:15840

JEFFERSON COUNTY, IOWA NO. 5



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MILE

KILOMETER

SCALE 1:15,840

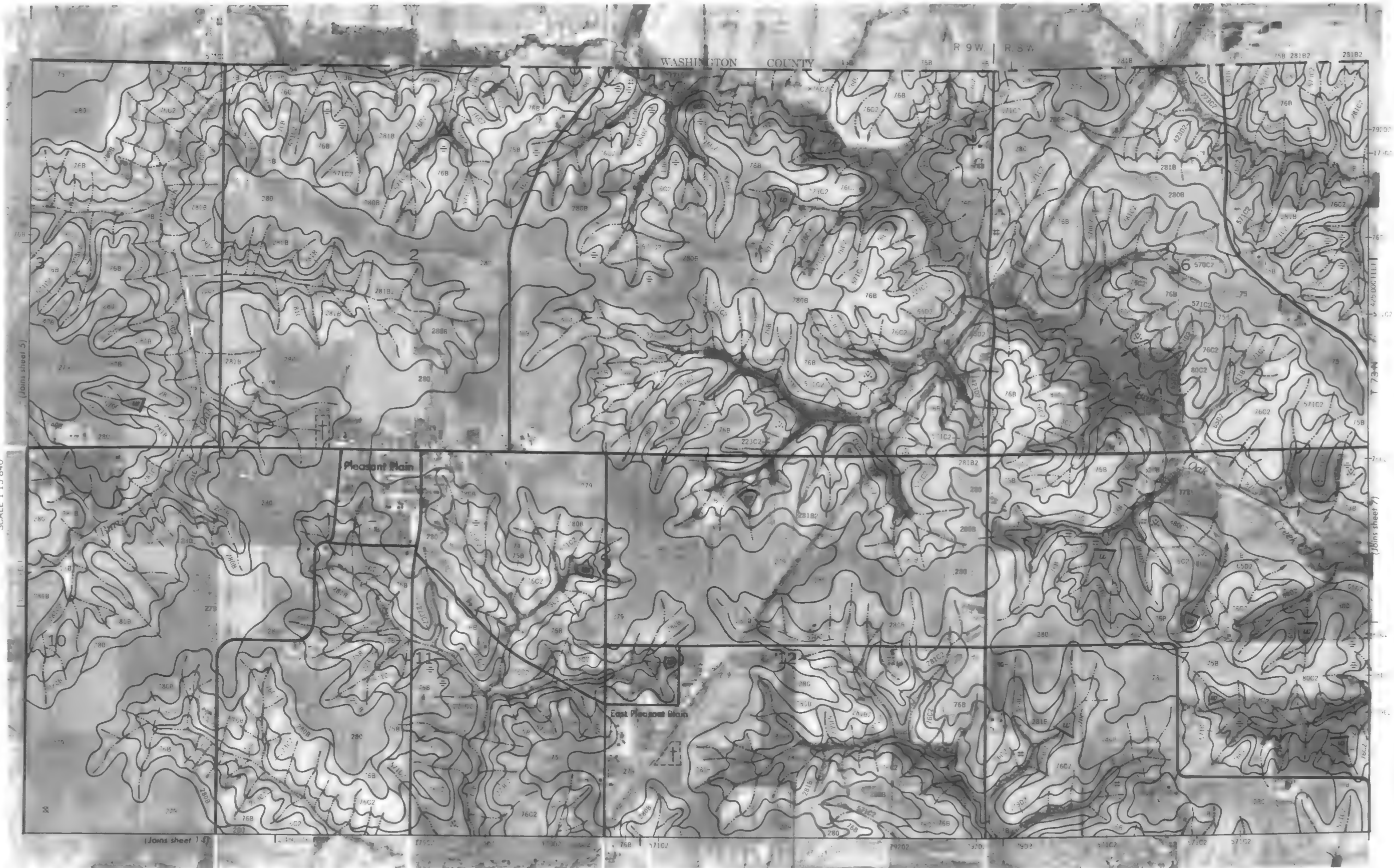
1.4

1.2

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JEFFERSON COUNTY, IOWA NO. 7



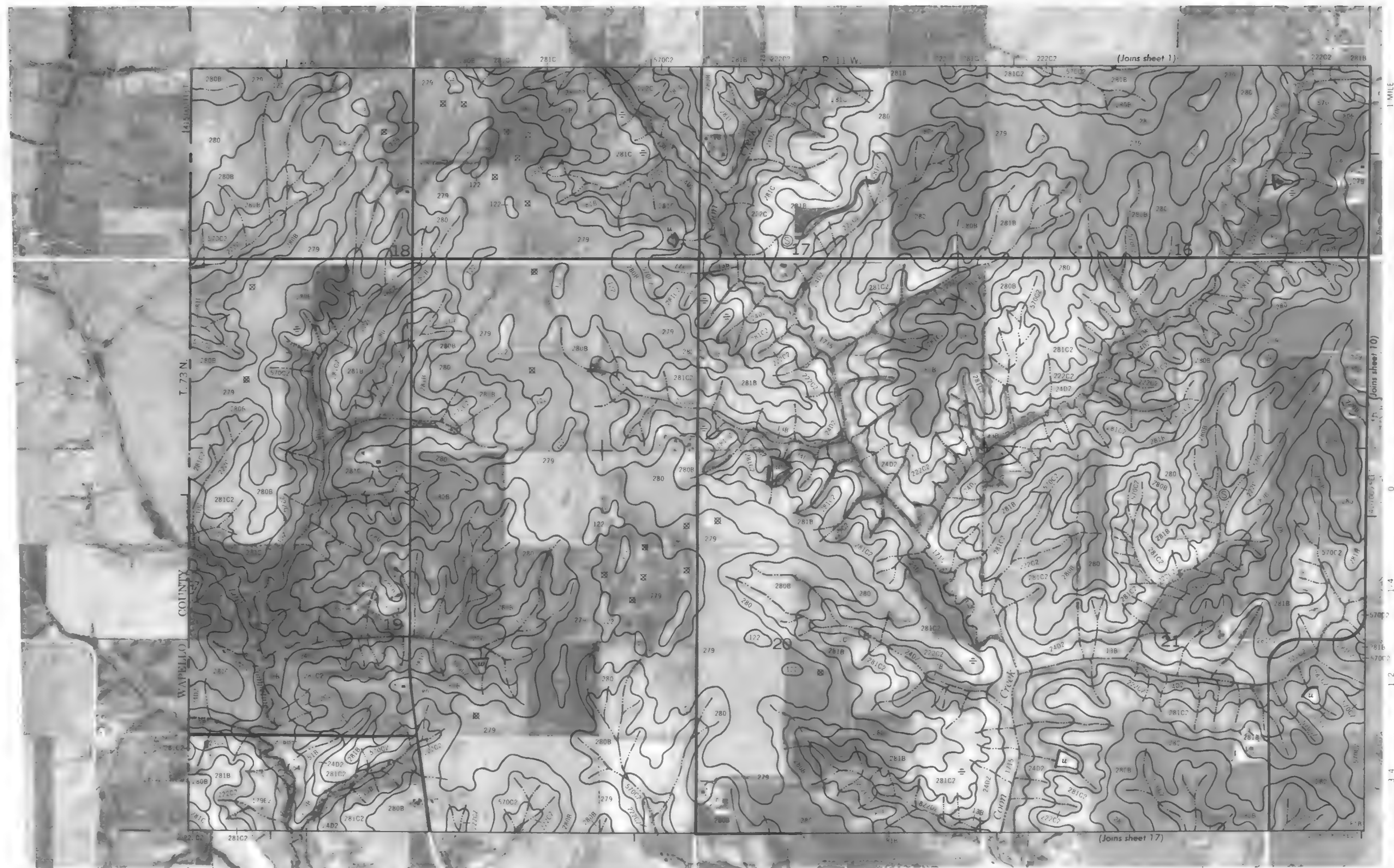


SCALE 1:15,840



SCALE 1:5840

JEFFERSON COUNTY, IOWA NO. 9





1 Mile

1 KILOMETER

SCALE 1:15,840

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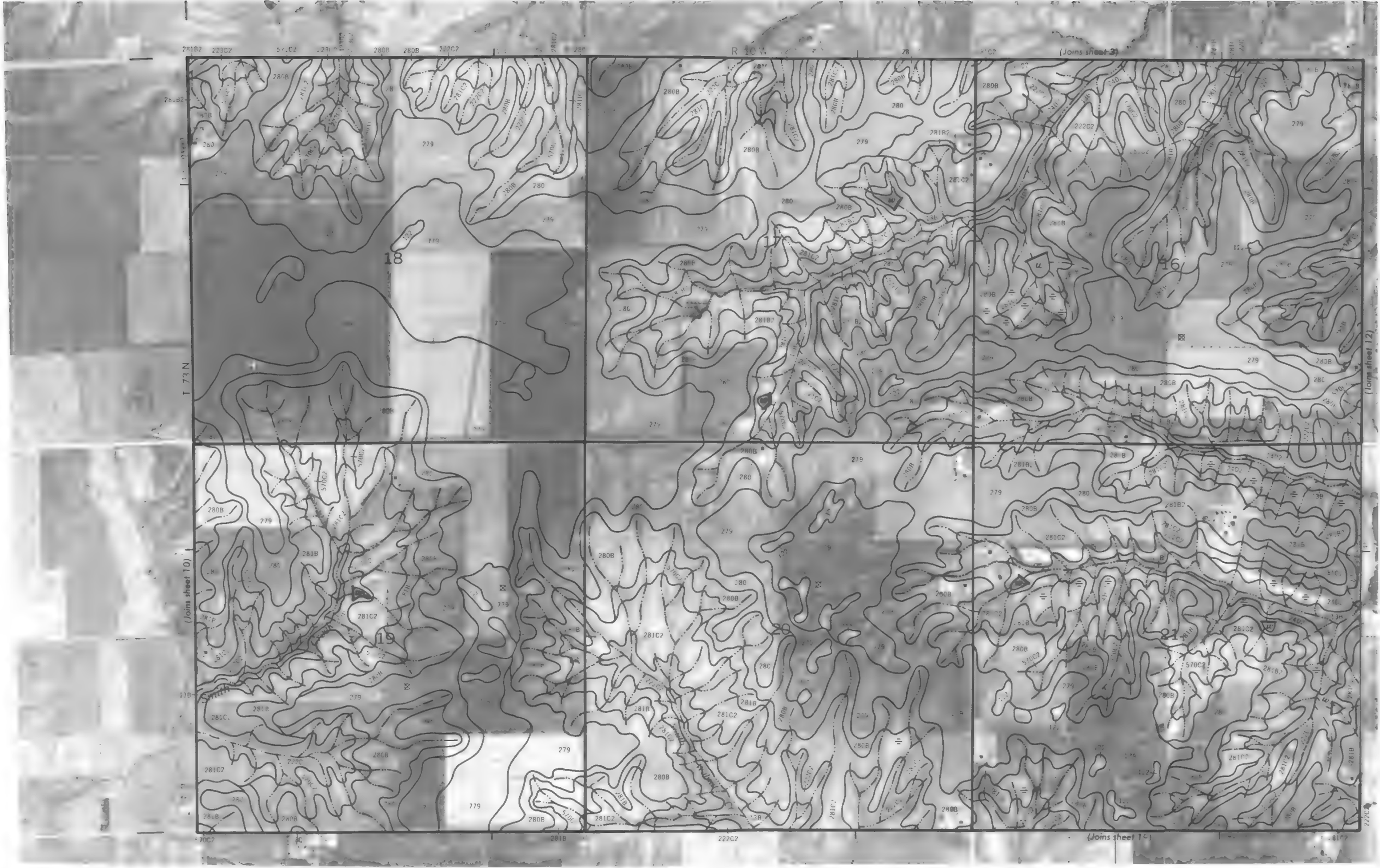
1 MILE

1 KILOMETER

SCALE 1:58,400

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, IOWA NO. 11

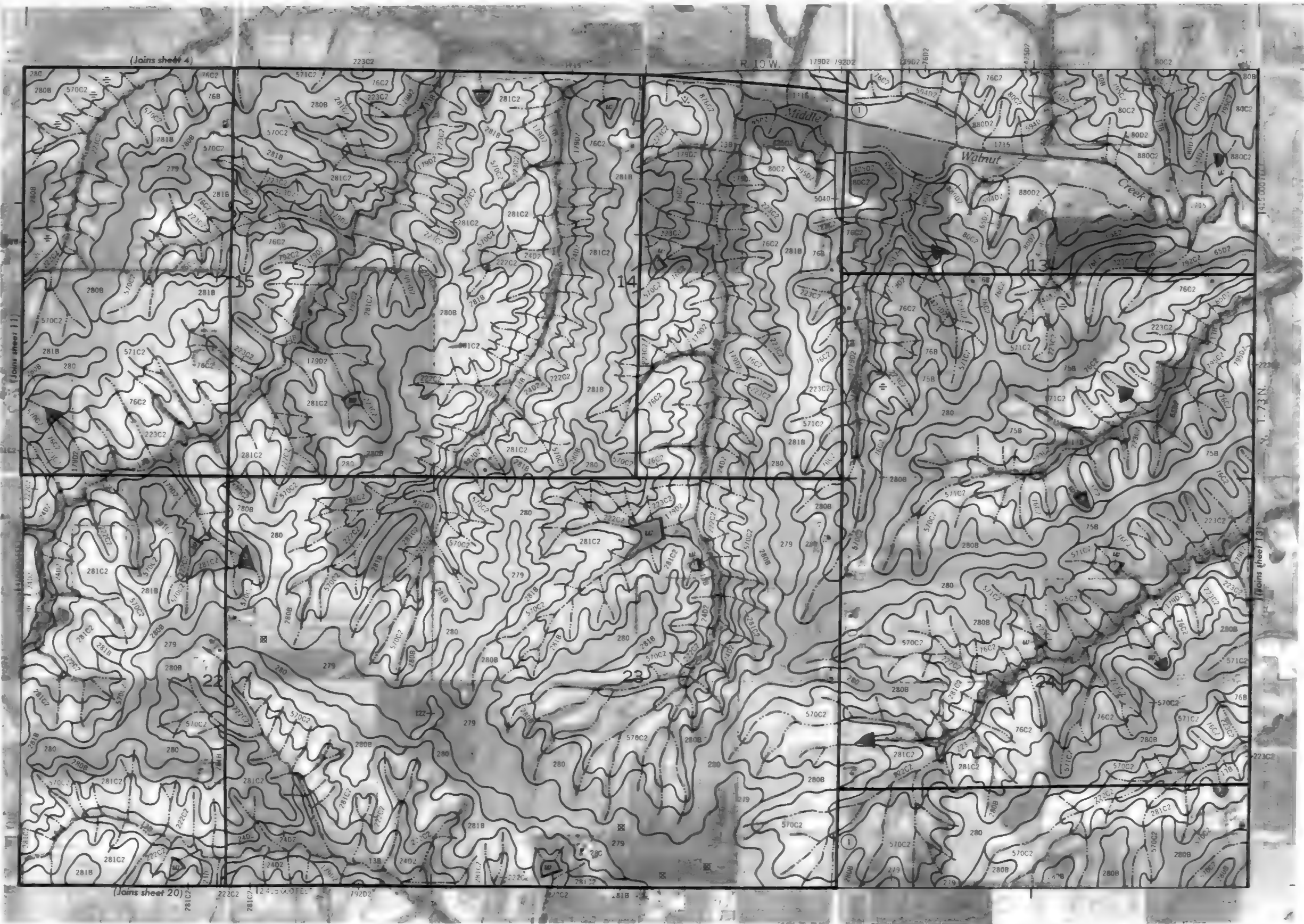




1 MILE

1 KILOMETER

SCALE 1:15,840



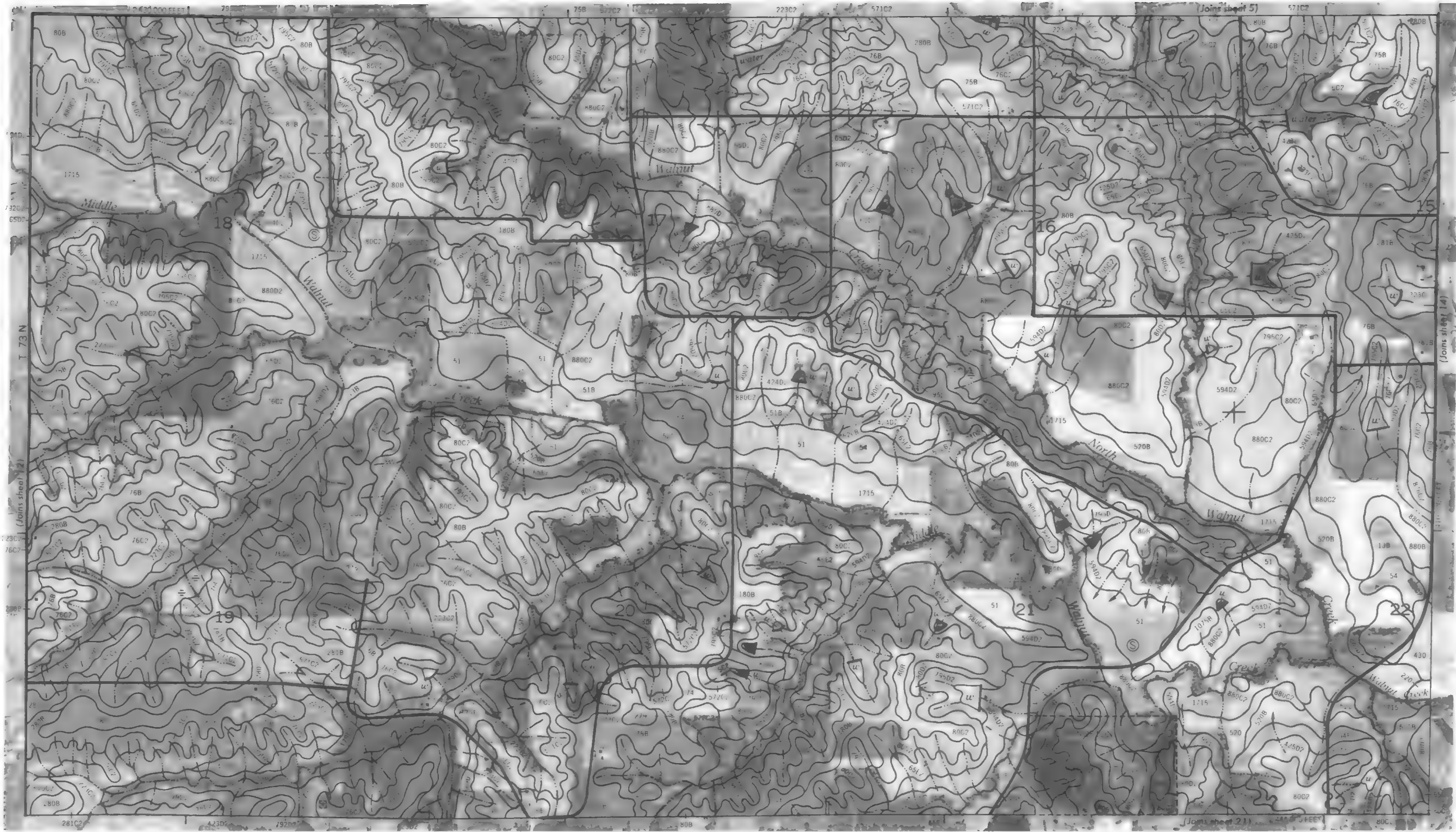


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SCALE 1:15,840

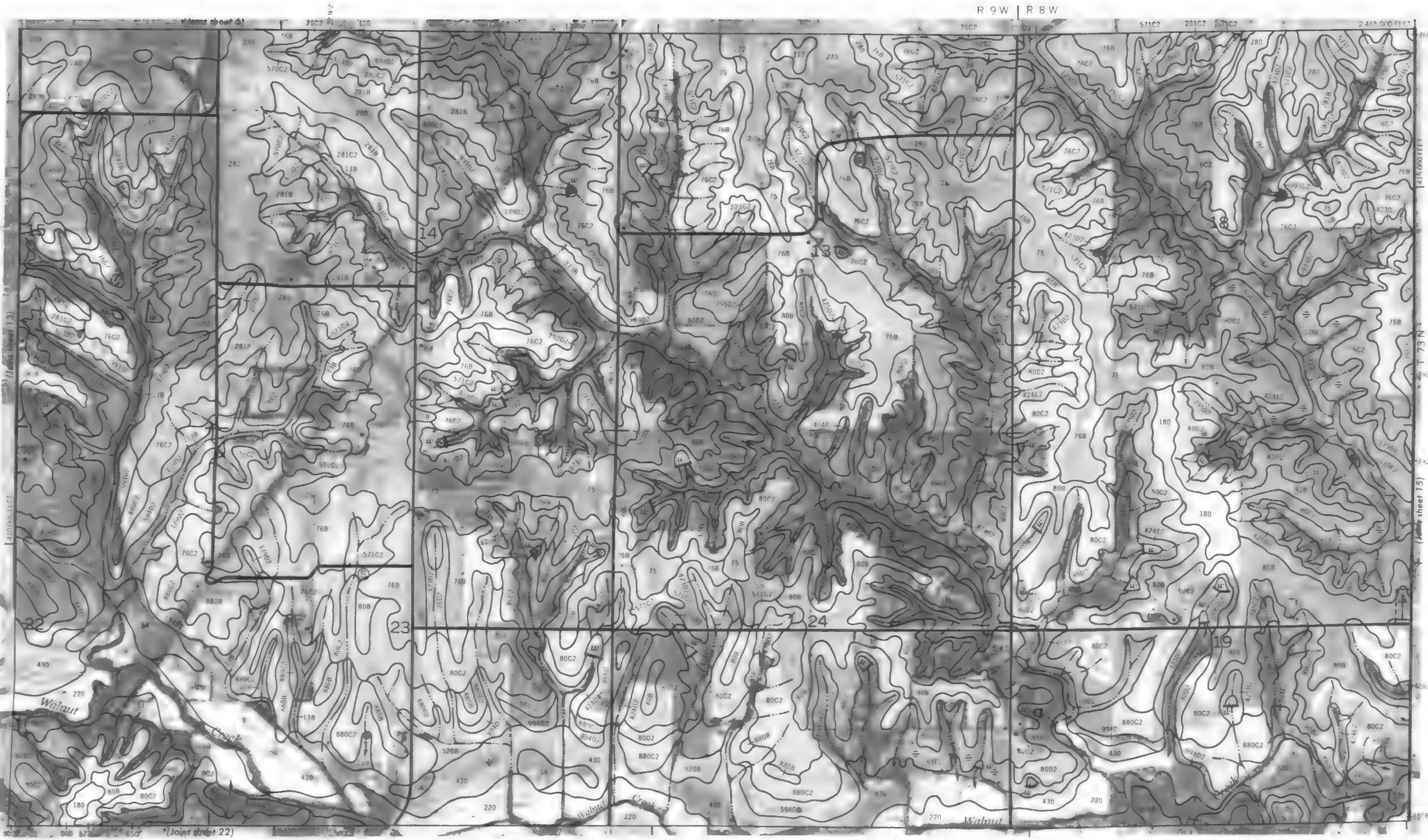
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JEFFERSON COUNTY, IOWA NO. 13





SCALE 1:15,840





JEFFERSON COUNTY, IOWA NO. 15



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1 MILE

1 KILOMETER

0

1/4

1/2

3/4

1

SCALE 1:15 840





1 MILE

1 KILOMETER

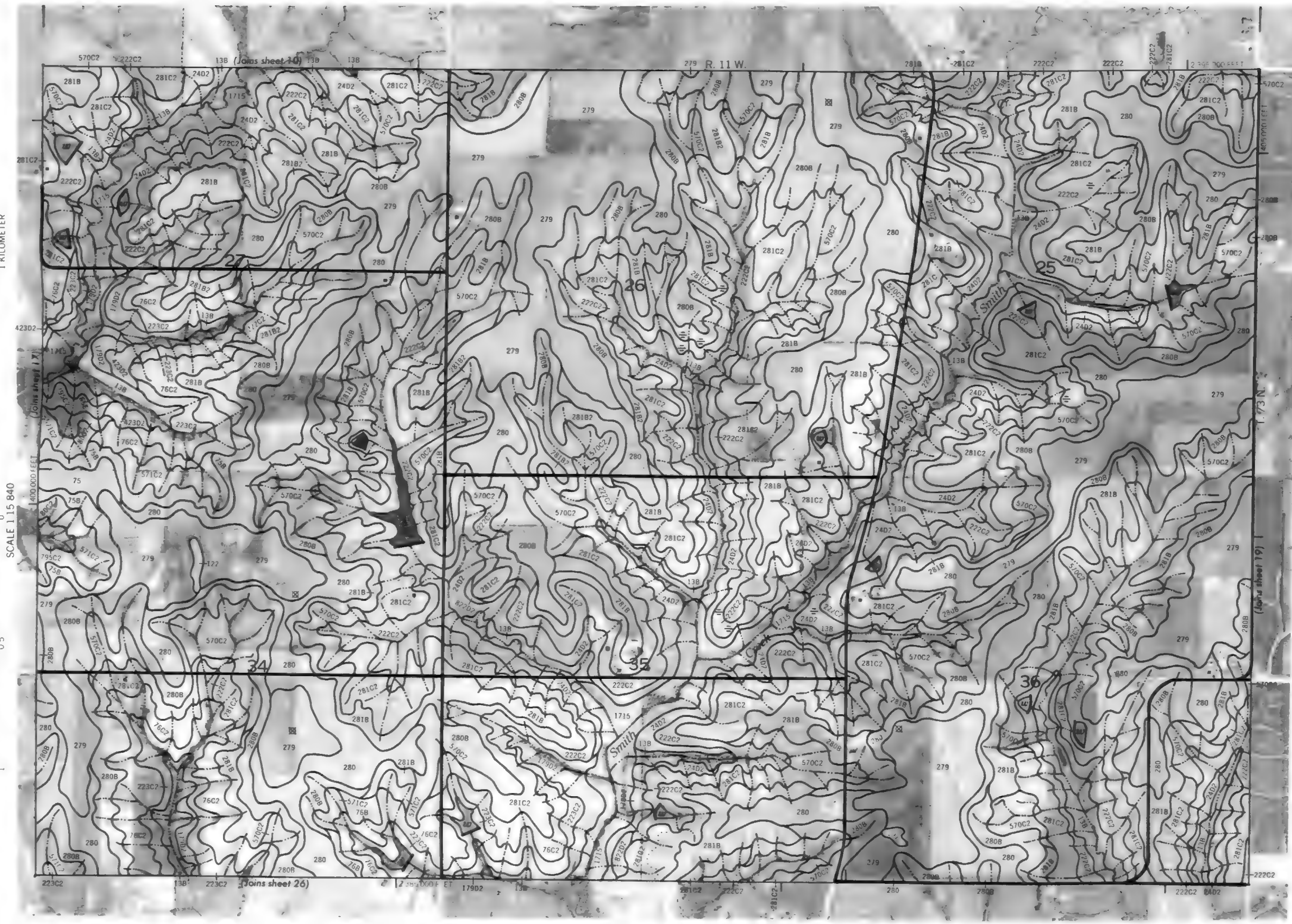
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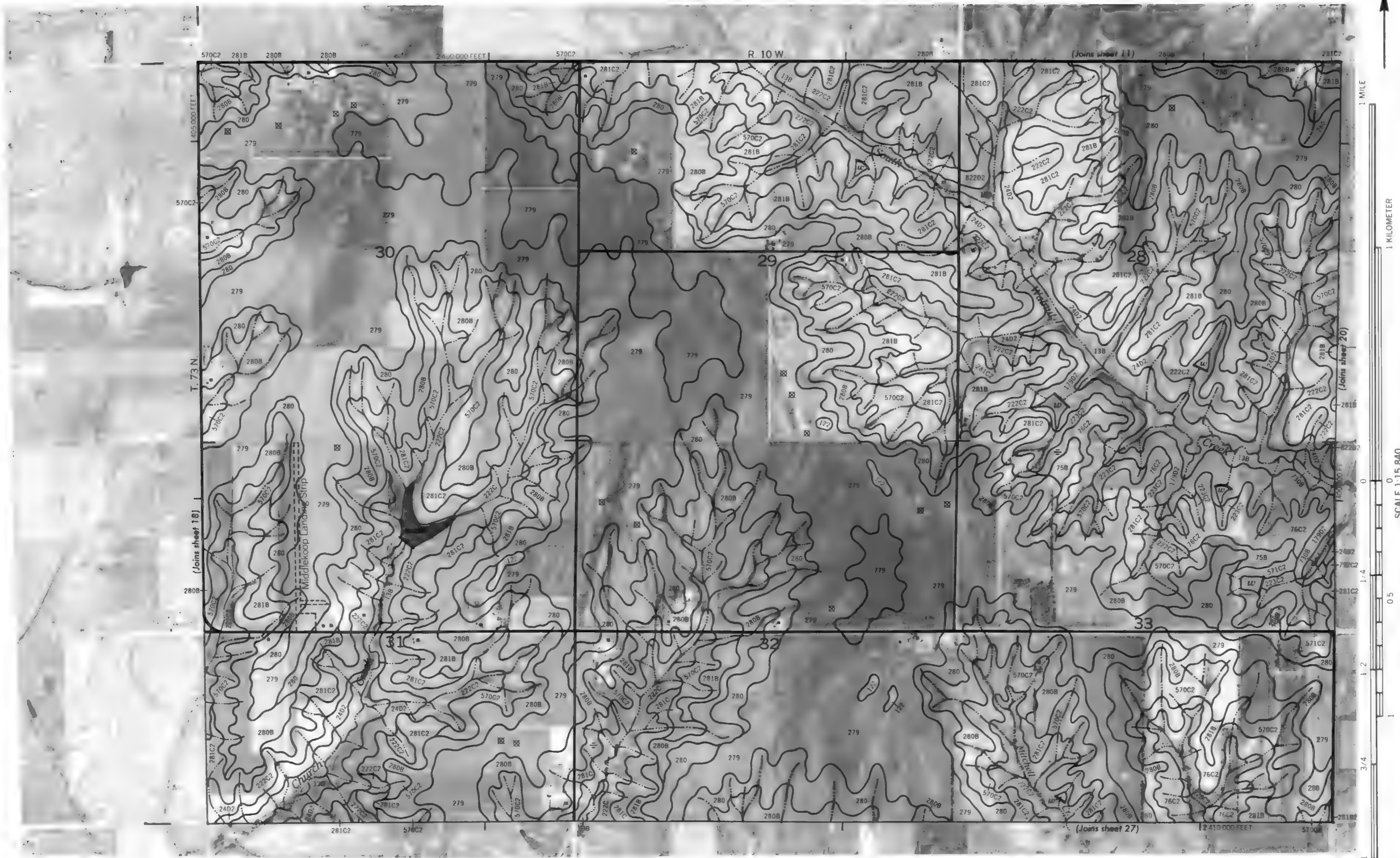
JEFFERSON COUNTY, IOWA NO. 17





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JEFFERSON COUNTY, IOWA NO. 19

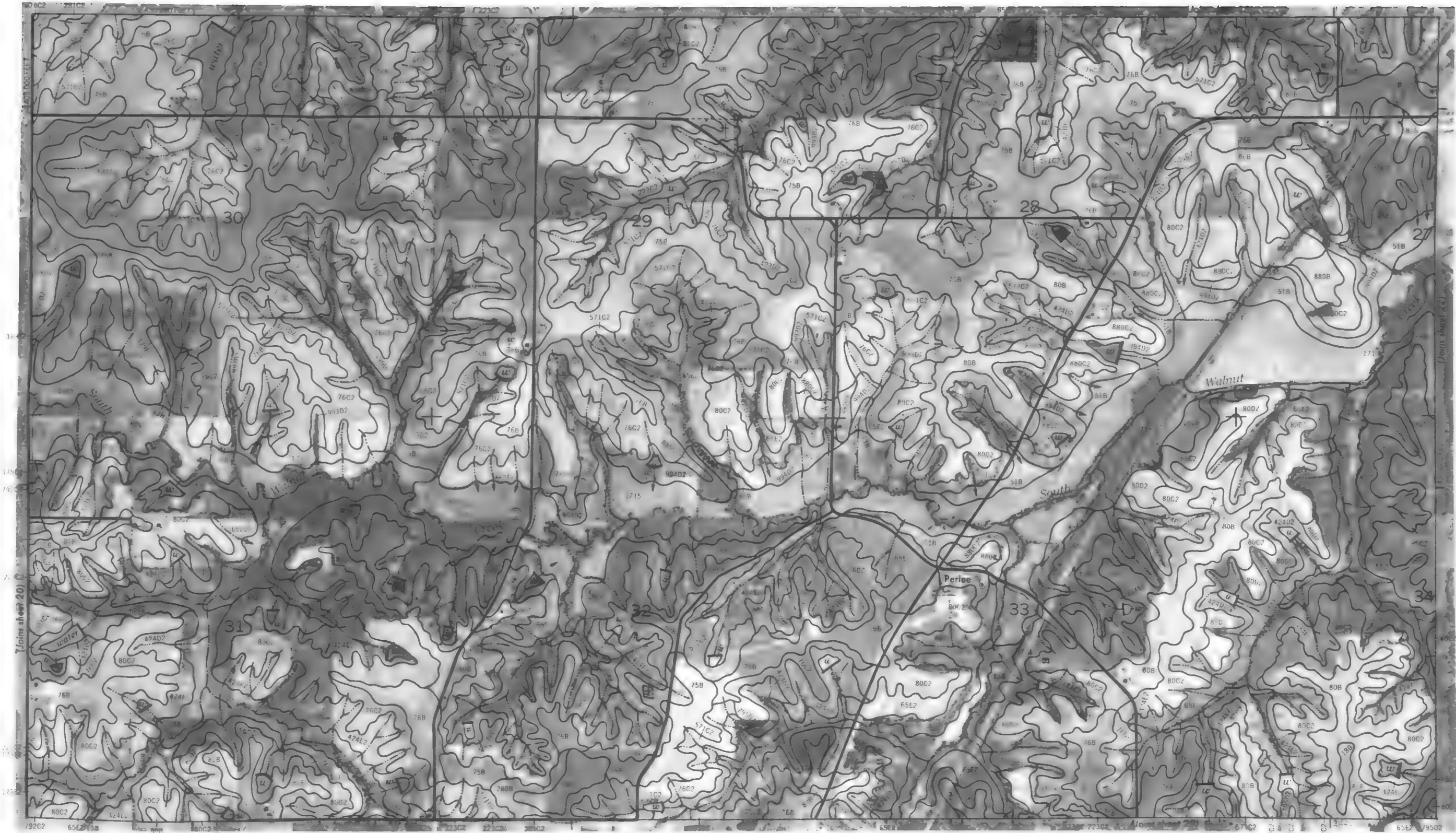






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JEFFERSON COUNTY, IOWA NO. 21



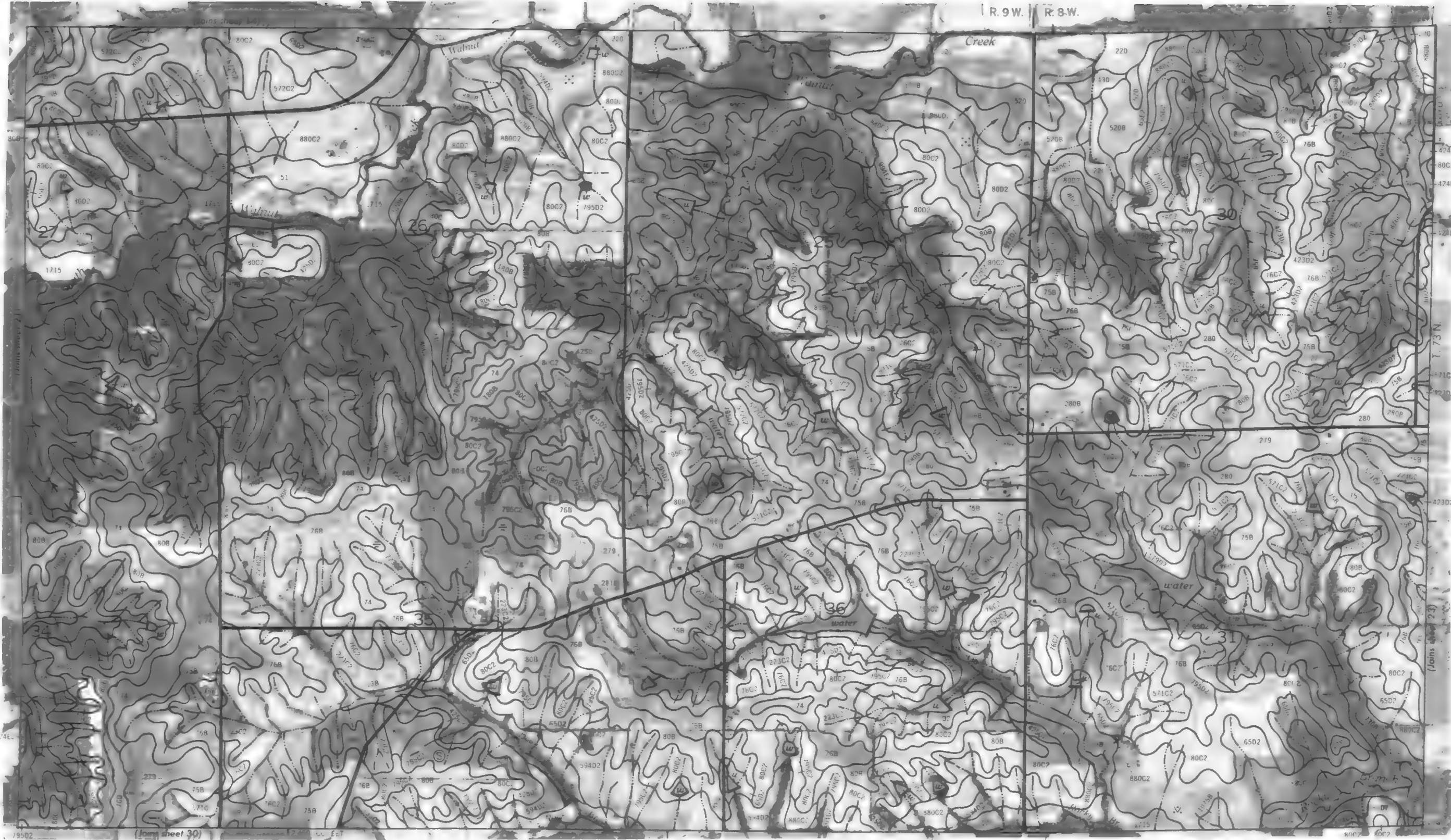
1 Mile

1 KILOMETER

SCALE 1:15,840



SCALE 1:15 840

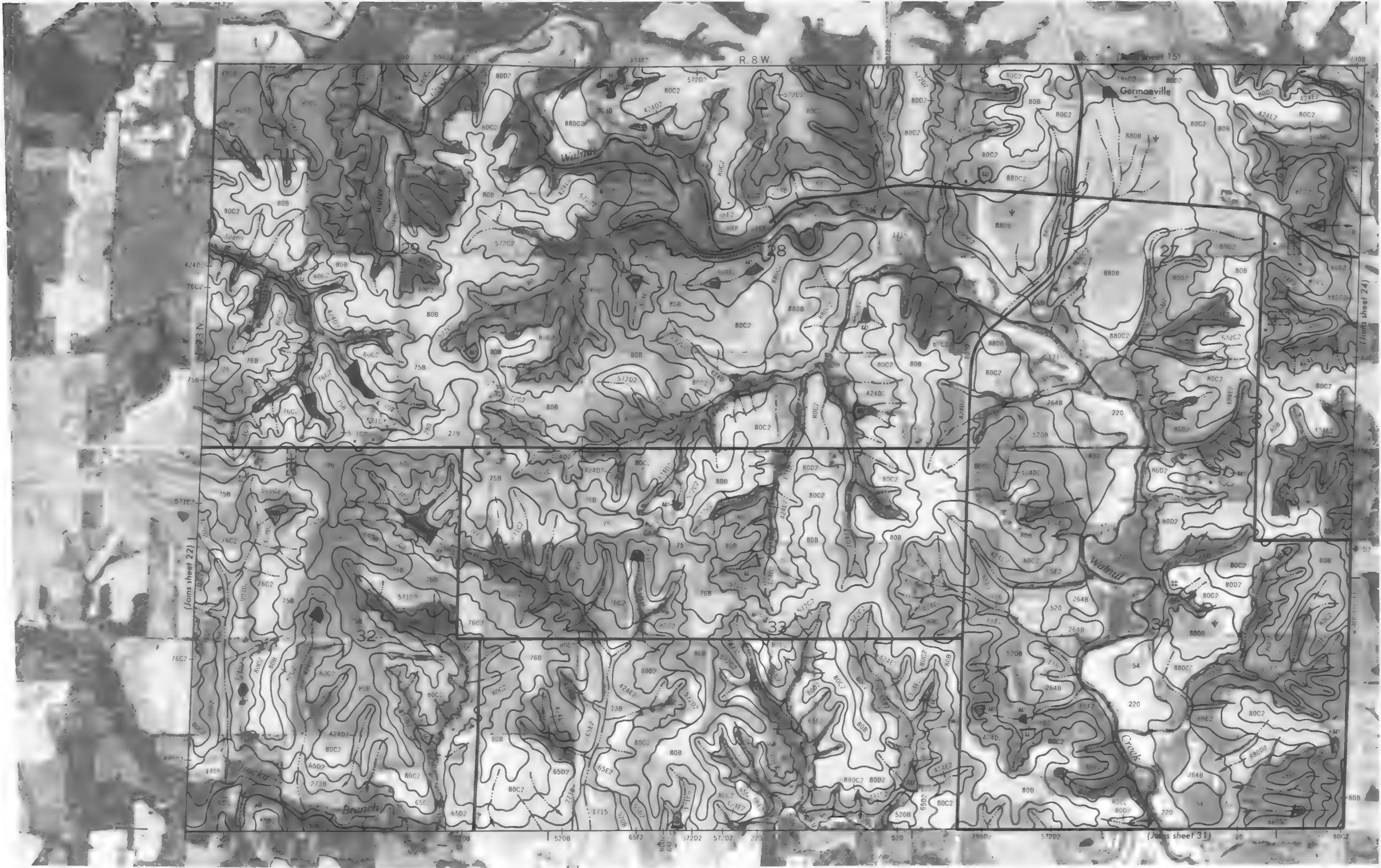


JEFFERSON COUNTY, IOWA NO. 22

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JEFFERSON COUNTY, IOWA NO. 23





1 MILE

1 KILOMETER

SCALE 1:15 840

1/4

0.5

1/2

1

3/4

1



JEFFERSON COUNTY, IOWA NO. 24

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1 MILE

1 KILOMETER

SCALE 1:15,840

0 0.5 1 1.2 1.4

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0 0.5 1 1.2 1.4

0 0.5 1 1.2 1.4



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JEFFERSON COUNTY, IOWA NO. 25



1 MILE

1 KILOMETER

SCALE 1:15,840

0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

0 0.2 0.4 0.6 0.8 1.0 1.2 1.4 1.6 1.8 2.0

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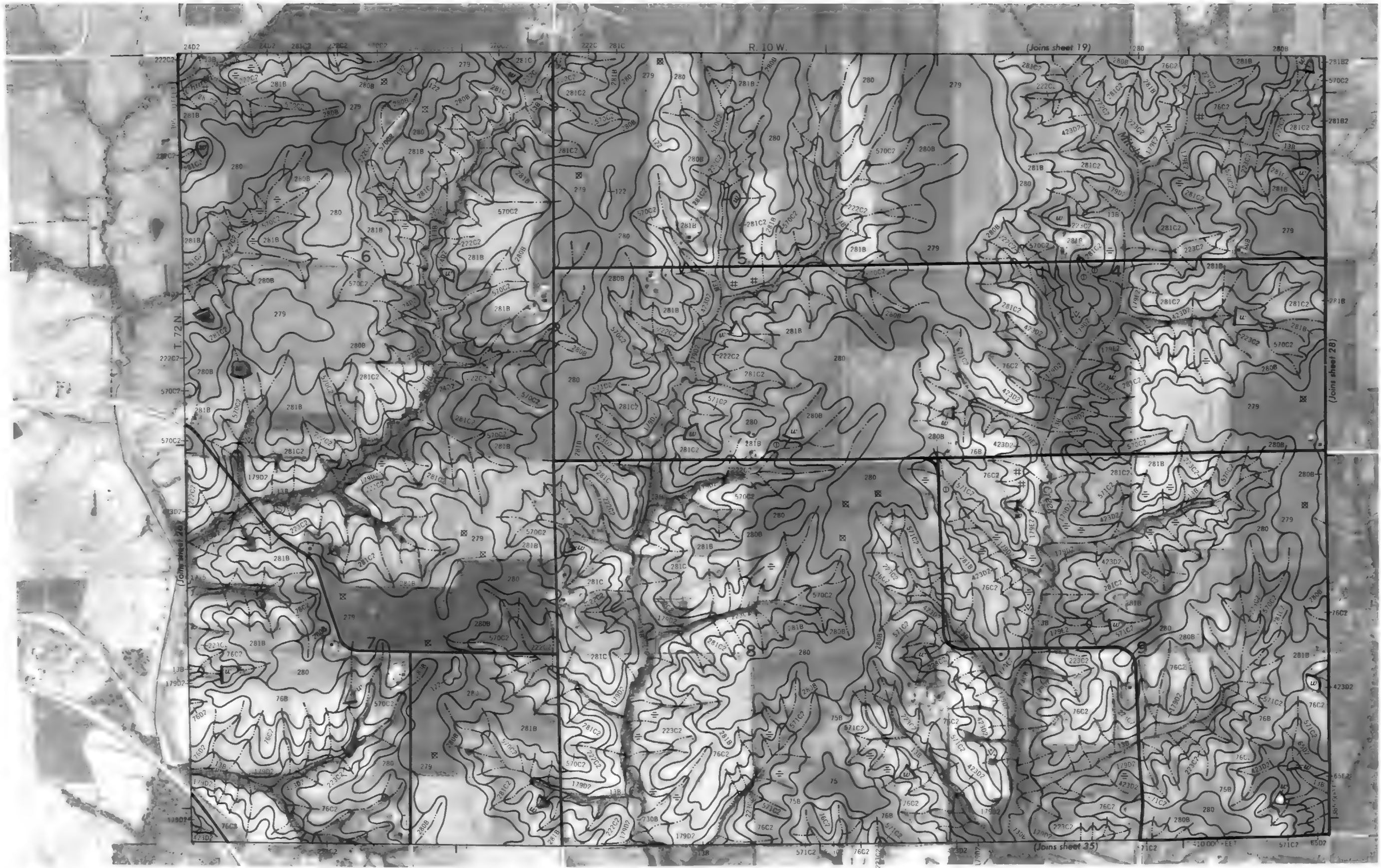




1 MILE

1 KILOMETER

SCALE 1:15 840



JEFFERSON COUNTY, IOWA NO. 27

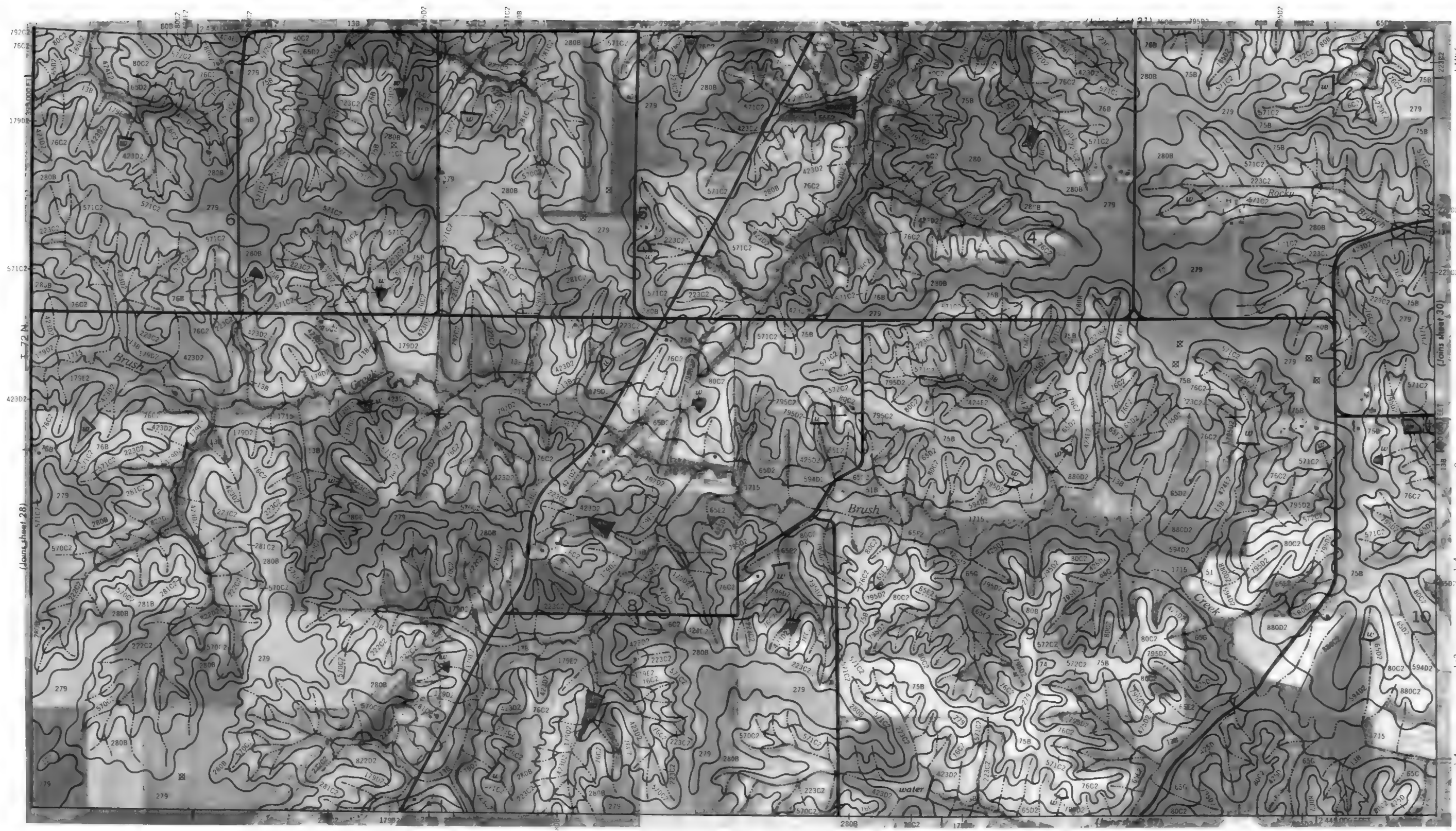
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This soil survey map was compiled by the U.S. Department of Agriculture Soil Conservation Service, and cooperating agencies. Base maps are from 1963 — 1964 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, IOWA NO. 29



SCALE 1:15 840

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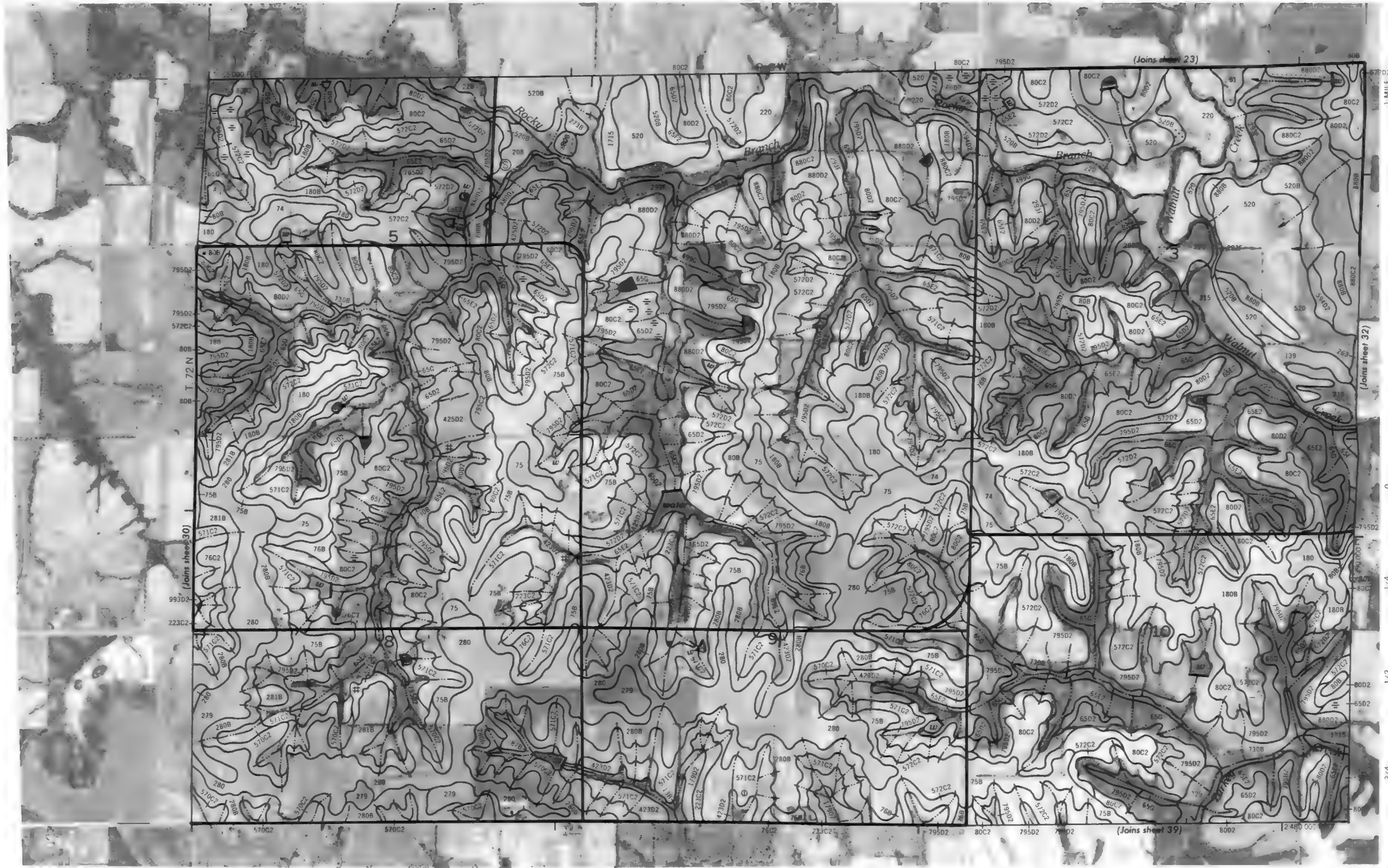
1 KILOMETER

SCALE 1:15 840



JEFFERSON COUNTY, IOWA NO. 31

This soil survey map was compiled by the U.S. Department of Agriculture Soil Conservation Service, and cooperating agencies. Base maps are from 1963 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned





JEFFERSON COUNTY, IOWA NO. 33





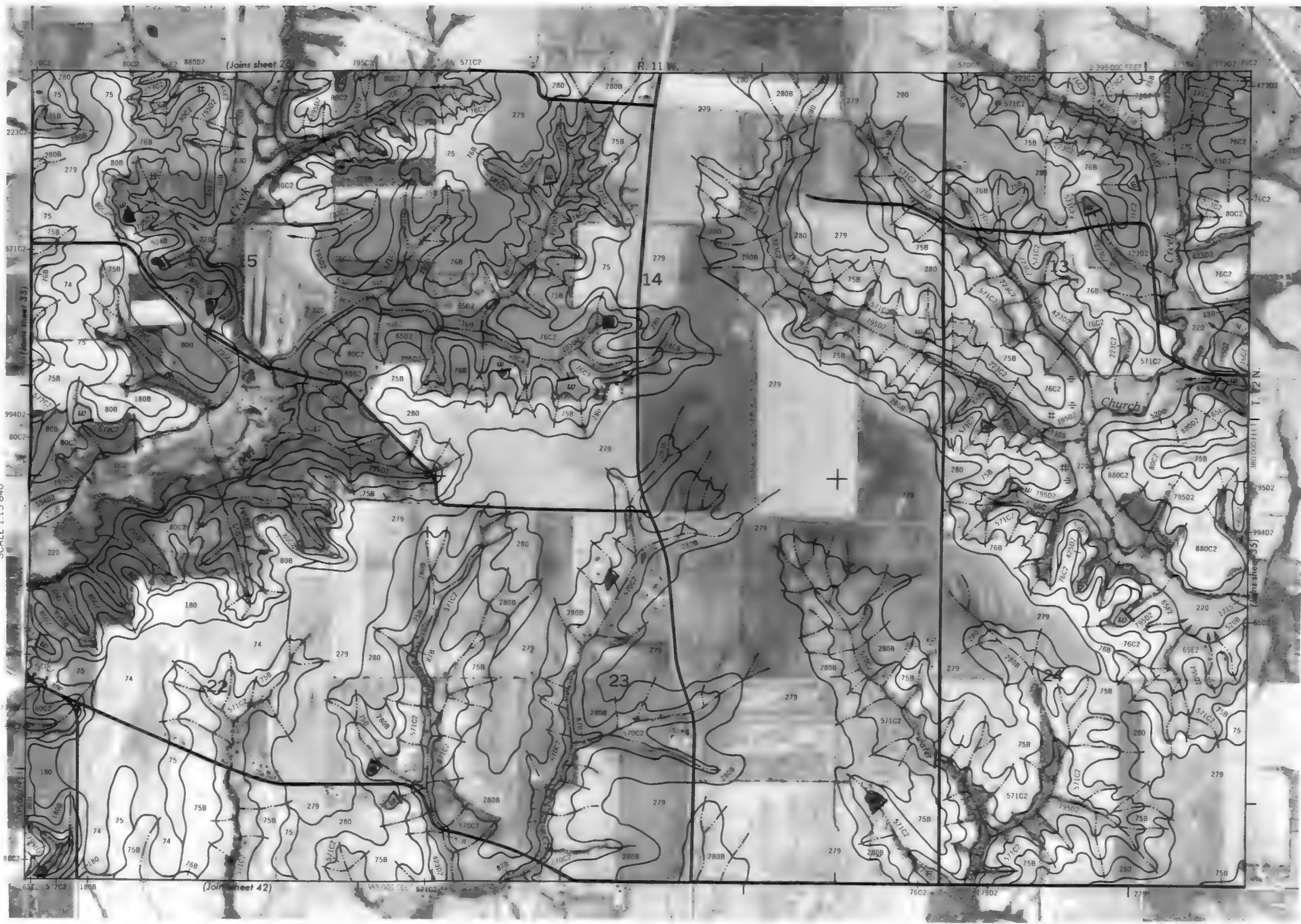
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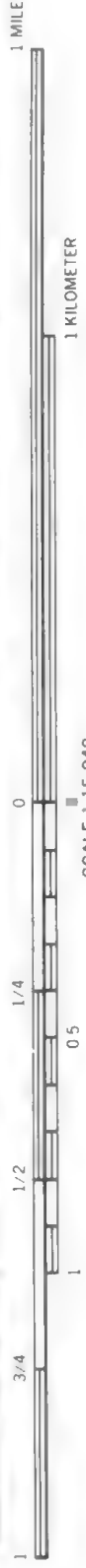
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SCALE 1:15 840

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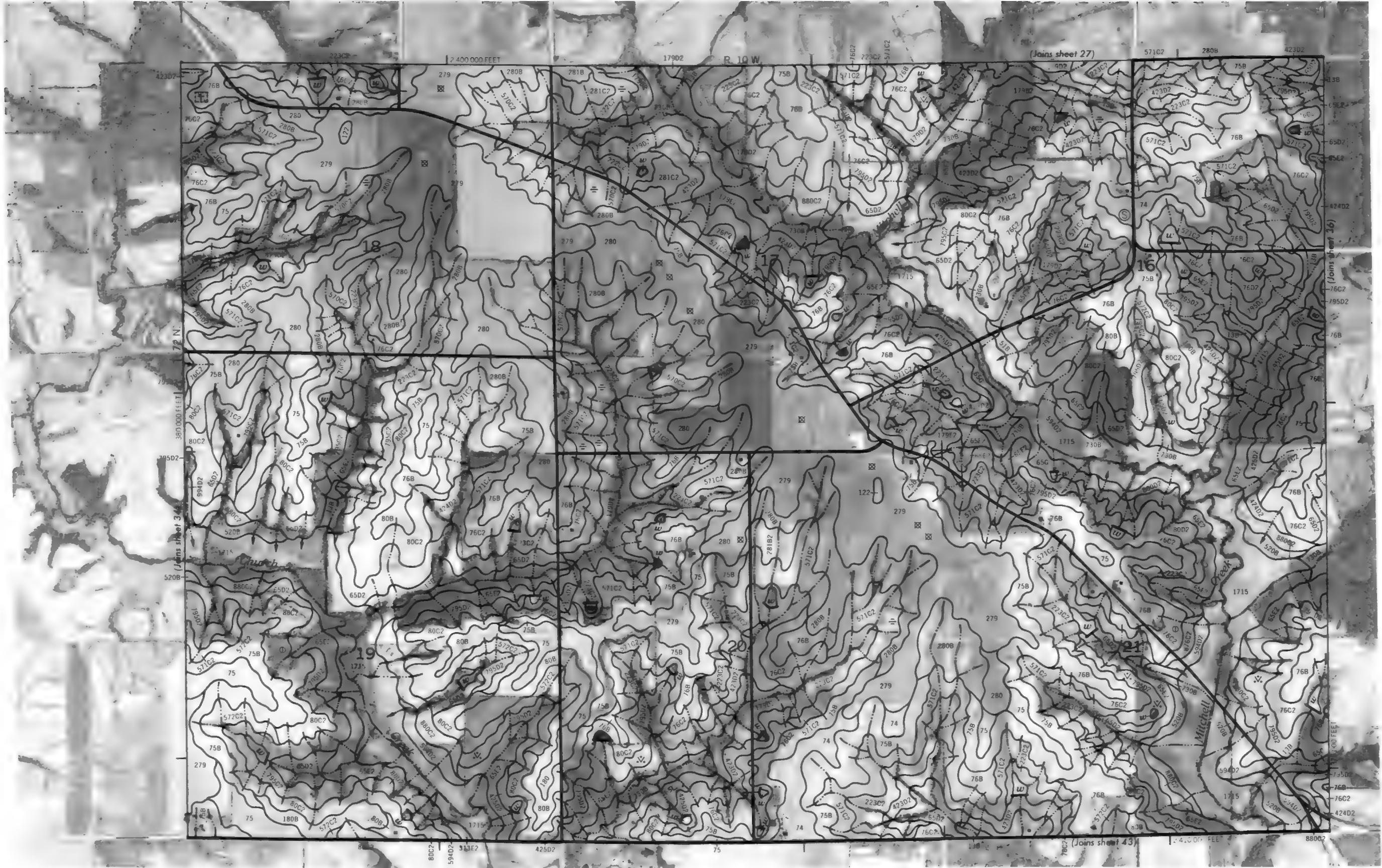




SCALE 1:15 840

JEFFERSON COUNTY, IOWA NO. 35

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

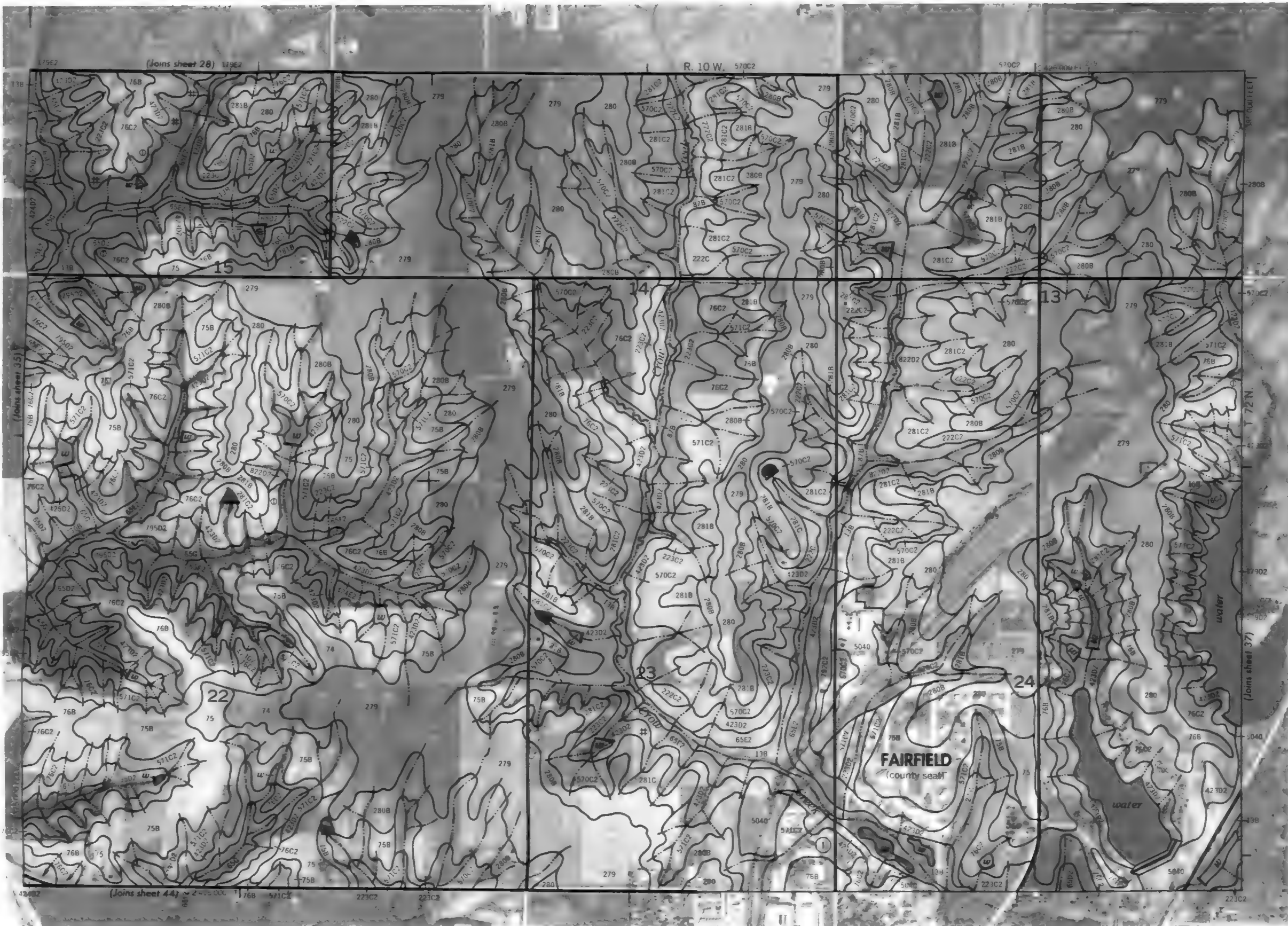




1 MILE

1 KILOMETER

SCALE 1:15 840



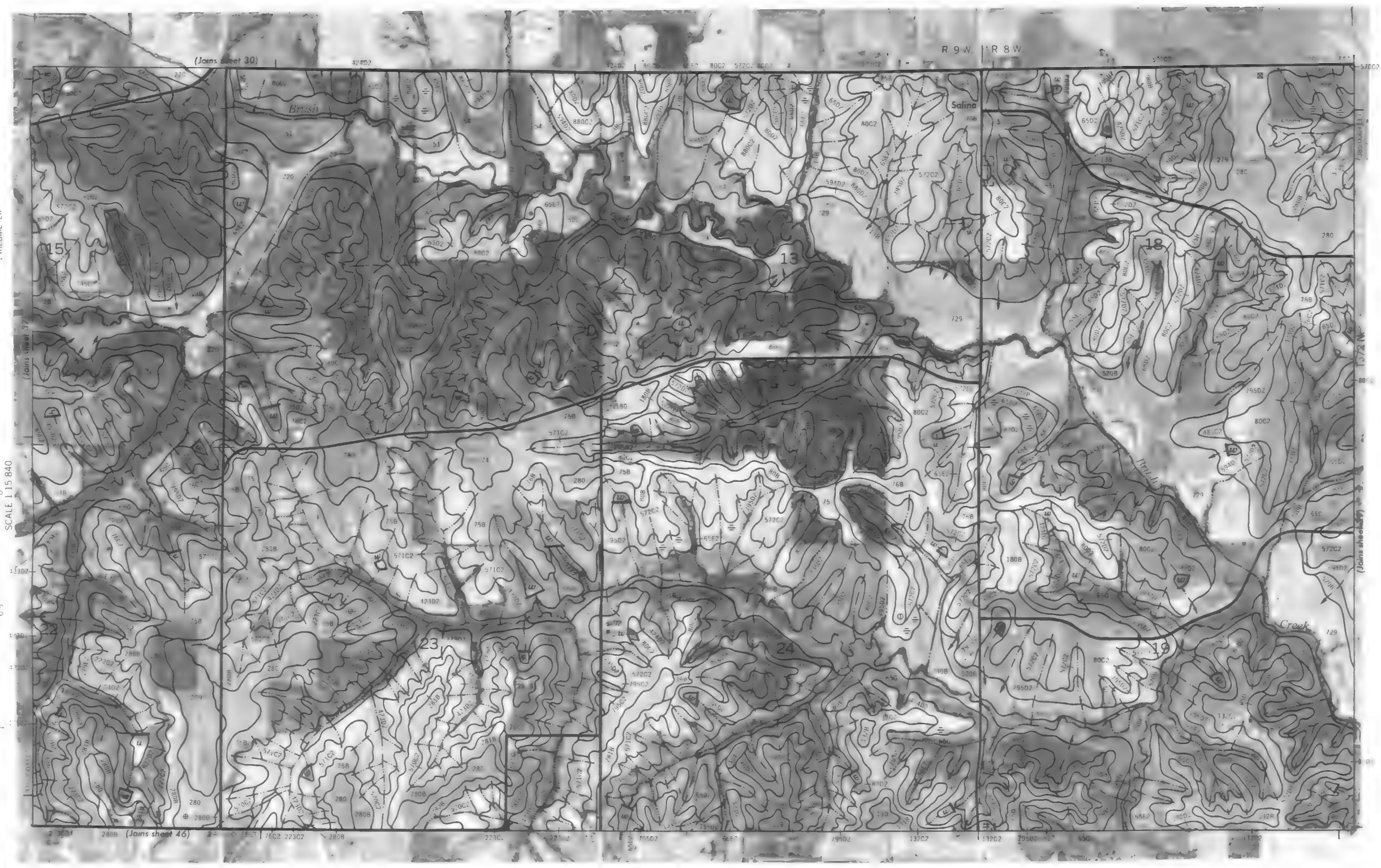
JEFFERSON COUNTY, IOWA NO. 37



3714

1 KILOMETER

0
SCALE 1:15 840



JEFFERSON COUNTY, IOWA NO. 38

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



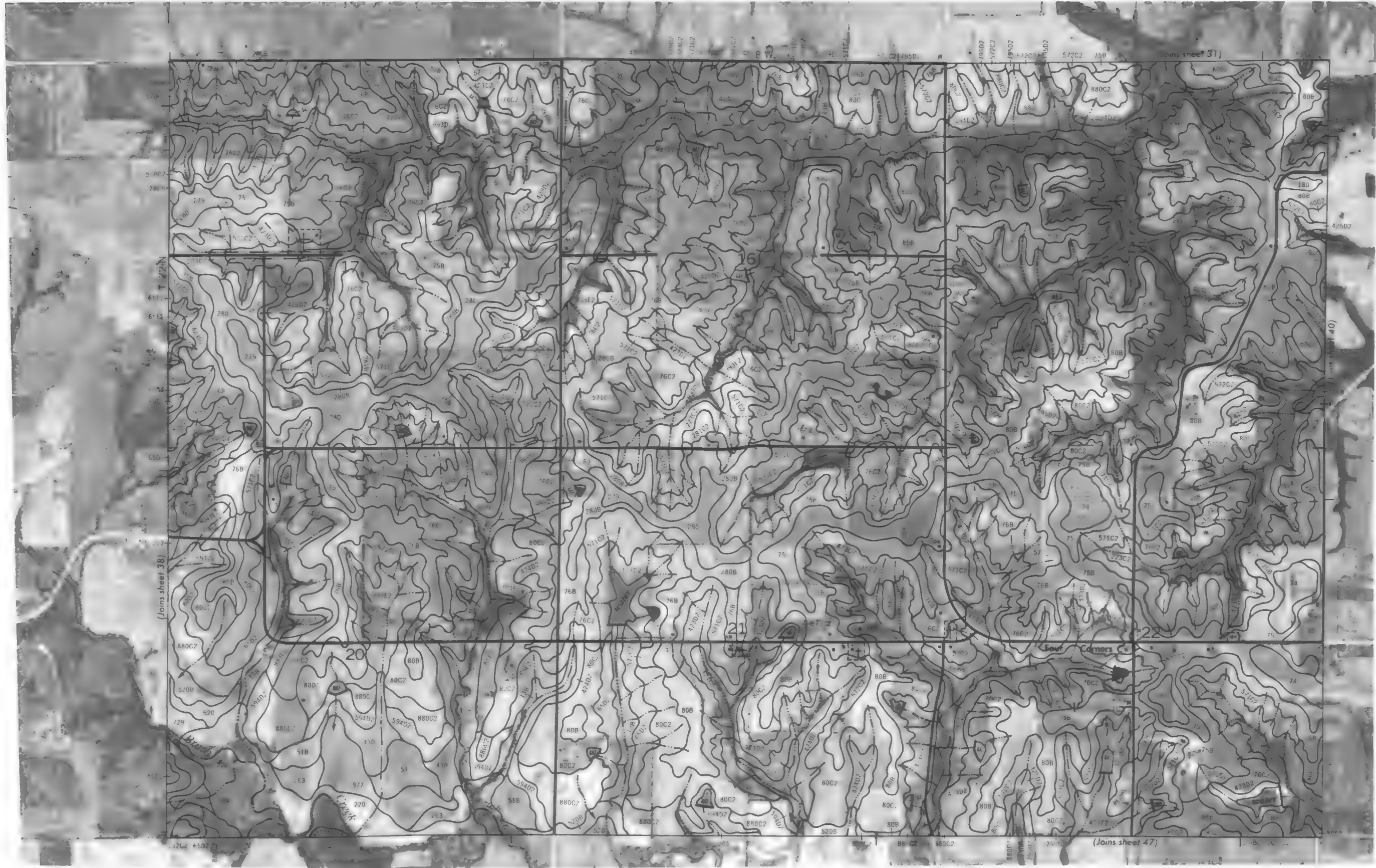
1 MILE

1 KILOMETER

SCALE 1:15 840

This soil survey map was compiled by the U.S. Department of Agriculture Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, IOWA NO. 39



N

1 MILE

1 KILOMETER

SCALE 115 840⁰

U

4

—

4

—

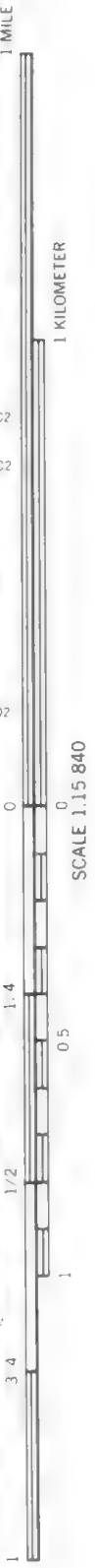


JEFFERSON COUNTY, IOWA NO. 40

This soil survey map was compiled by the U S Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, IOWA NO. 41





1 MILE

1 KILOMETER

SCALE 1:15 840

0 0.5 1 1.2 1.4

1 2 3 4





1 MILE

1 KILOMETER

SCALE 1:15 840

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

JEFFERSON COUNTY, IOWA NO. 43

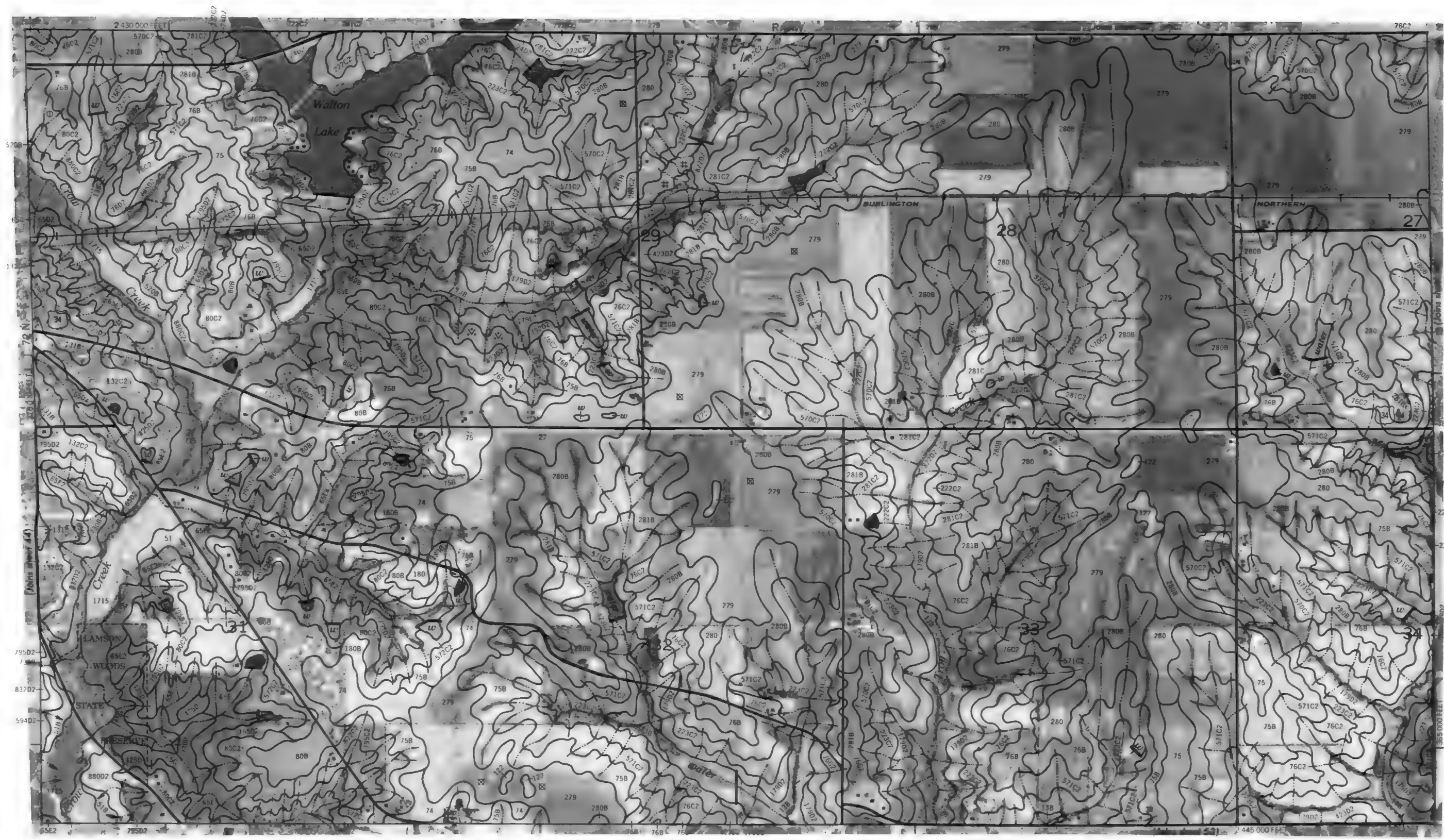






JEFFERSON COUNTY, IOWA NO. 45

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1933 — 1944 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 MILE

1 KILOMETER

SCALE 1:15 840



1 MILE

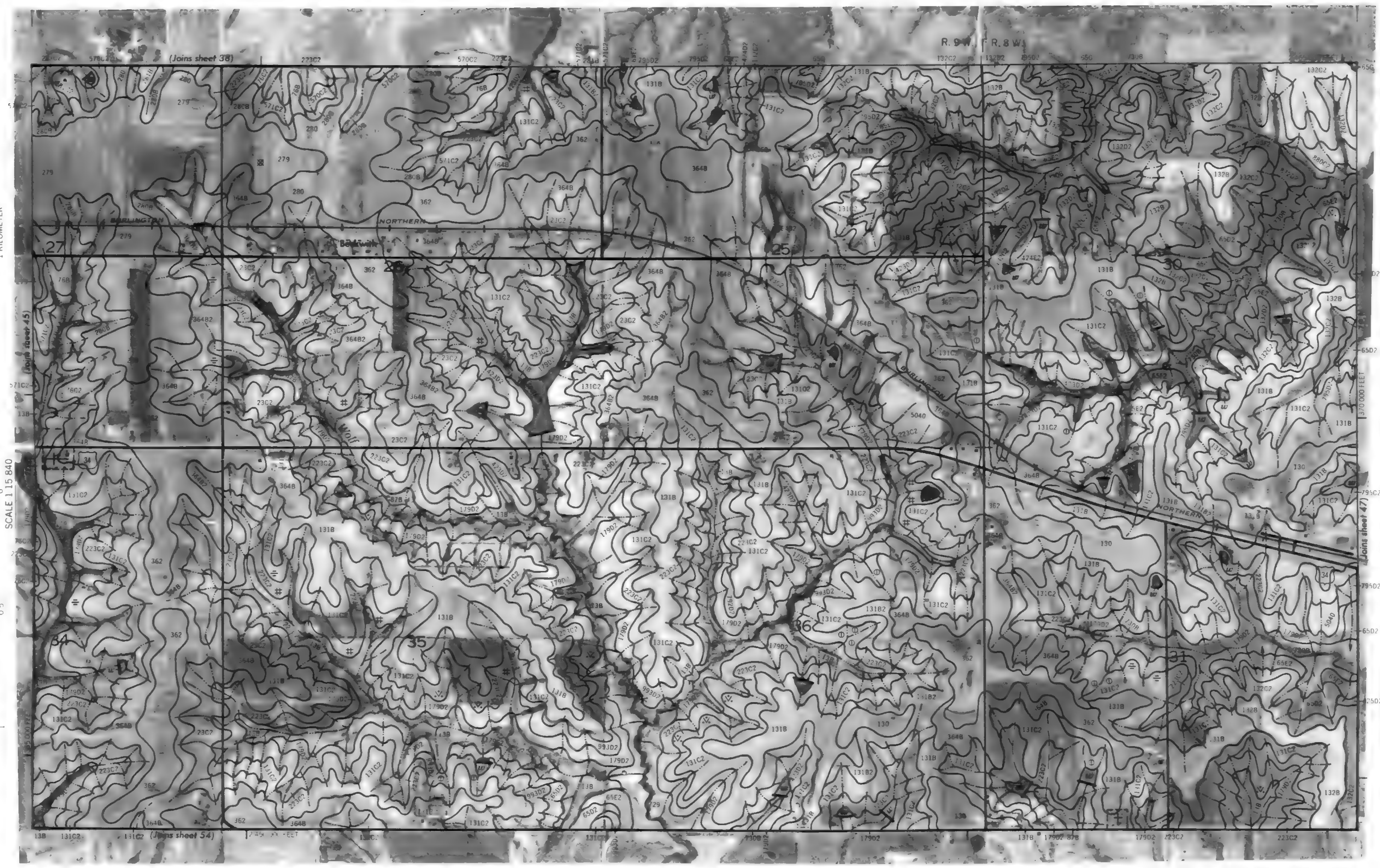
1 KILOMETER

SCALE 1:5840

0.5

1.2

3.4



31 KILOMETER

0	
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JEFFERSON COUNTY, IOWA NO. 47



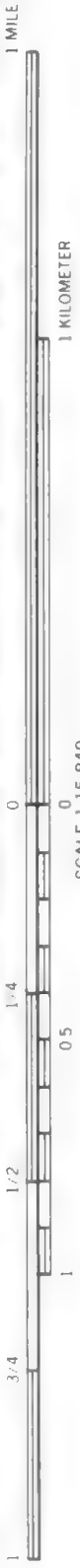


1 MILE

1 KILOMETER

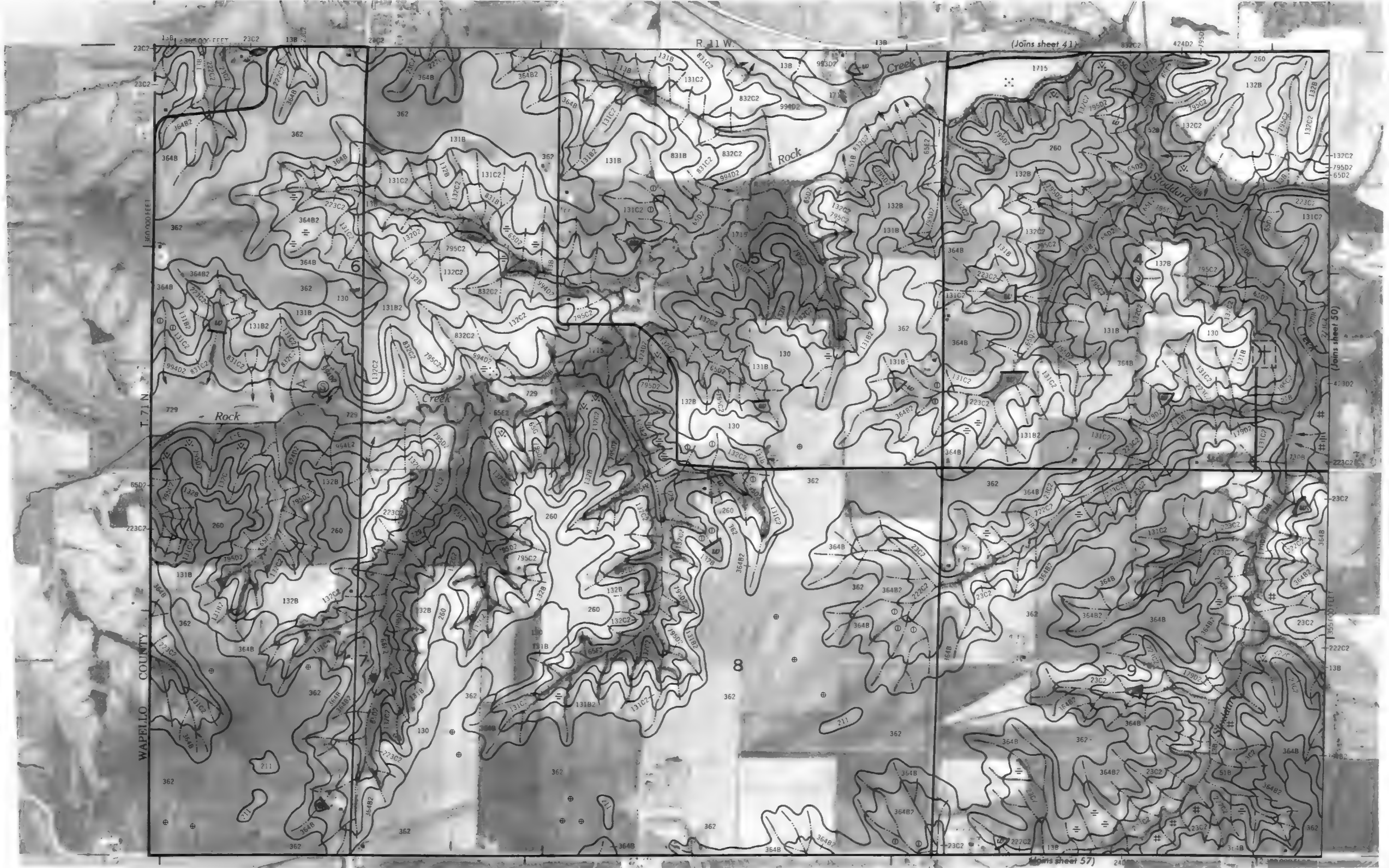
SCALE 1:15,840





SCALE 1:15,840

JEFFERSON COUNTY, IOWA NO. 49



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.



1 MILE

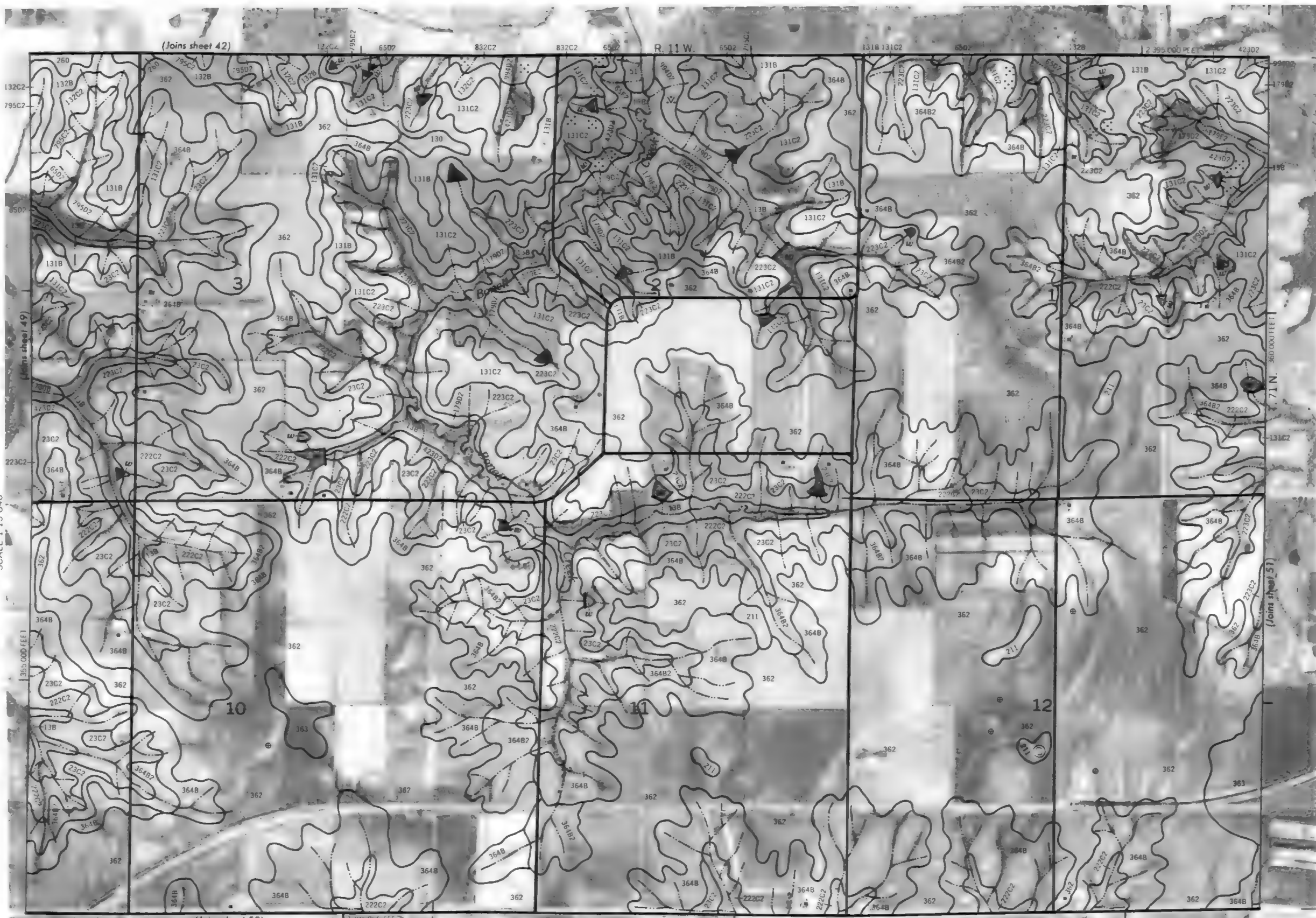
1 KILOMETER

SCALE 1:15,840

0.5

1.2

3.4

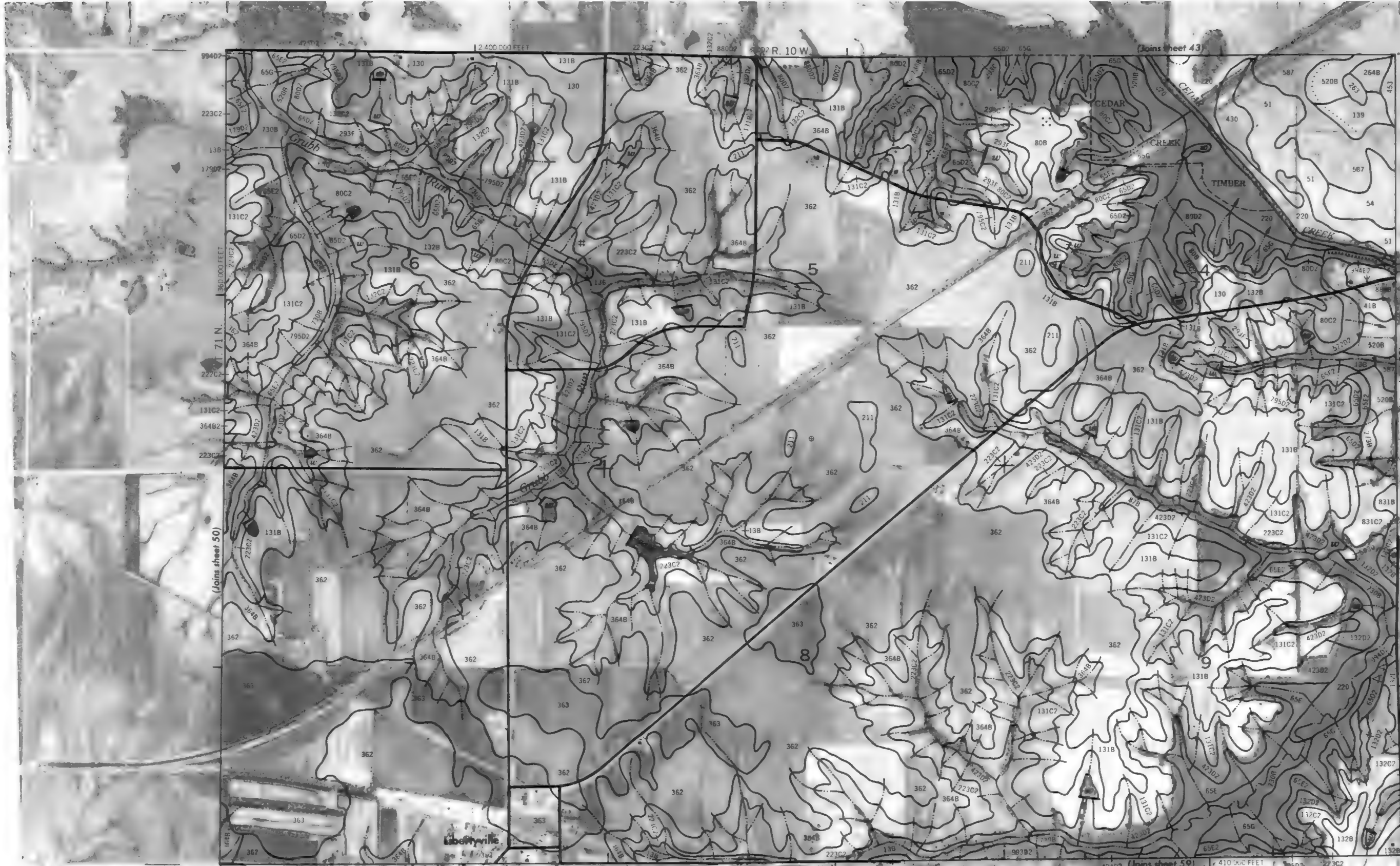


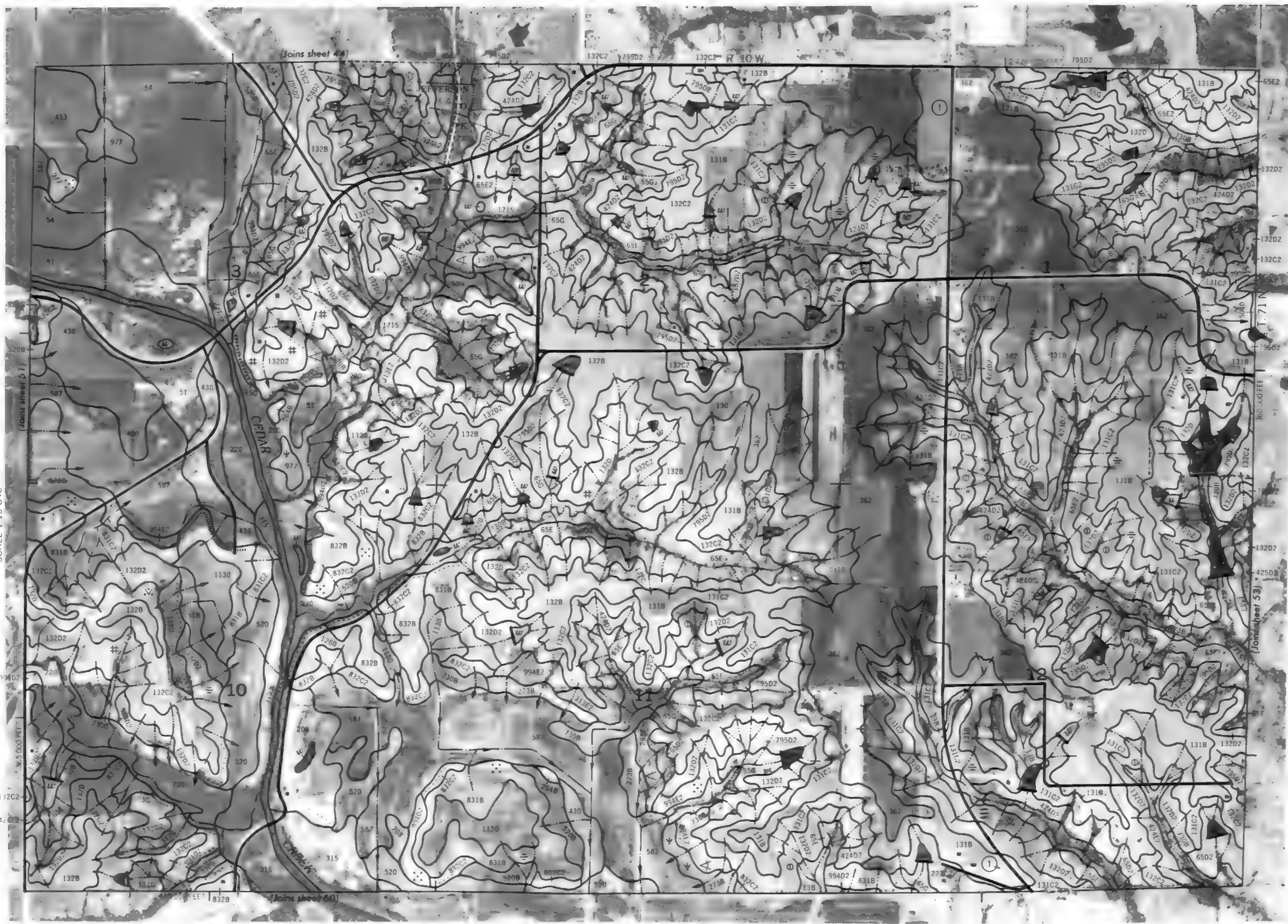


SCALE 1:15 840

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, IOWA NO. 51







This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, IOWA NO. 53



1 KILOMETER

SCALE 1:15 840

1 MILE

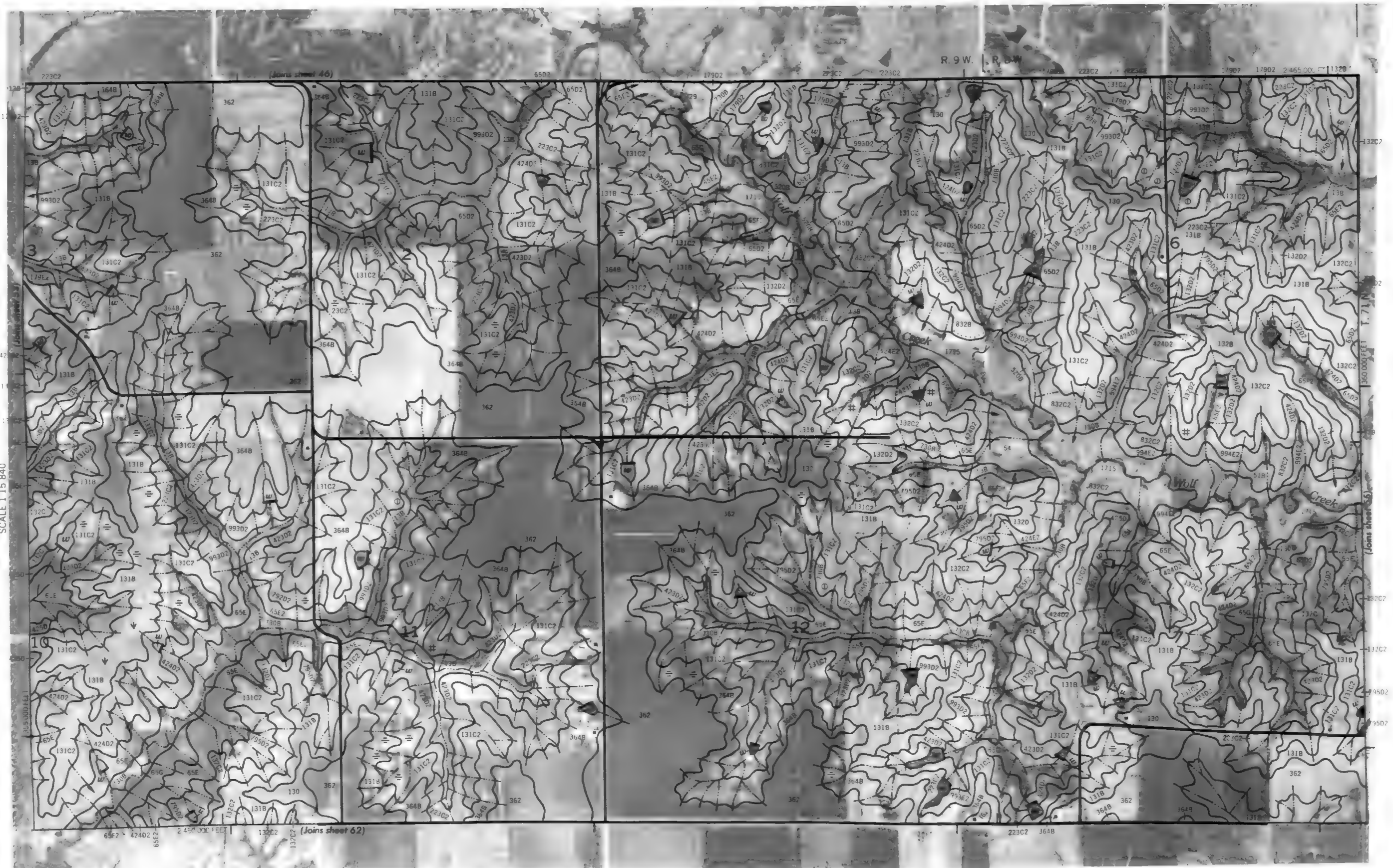
0

41

21

34

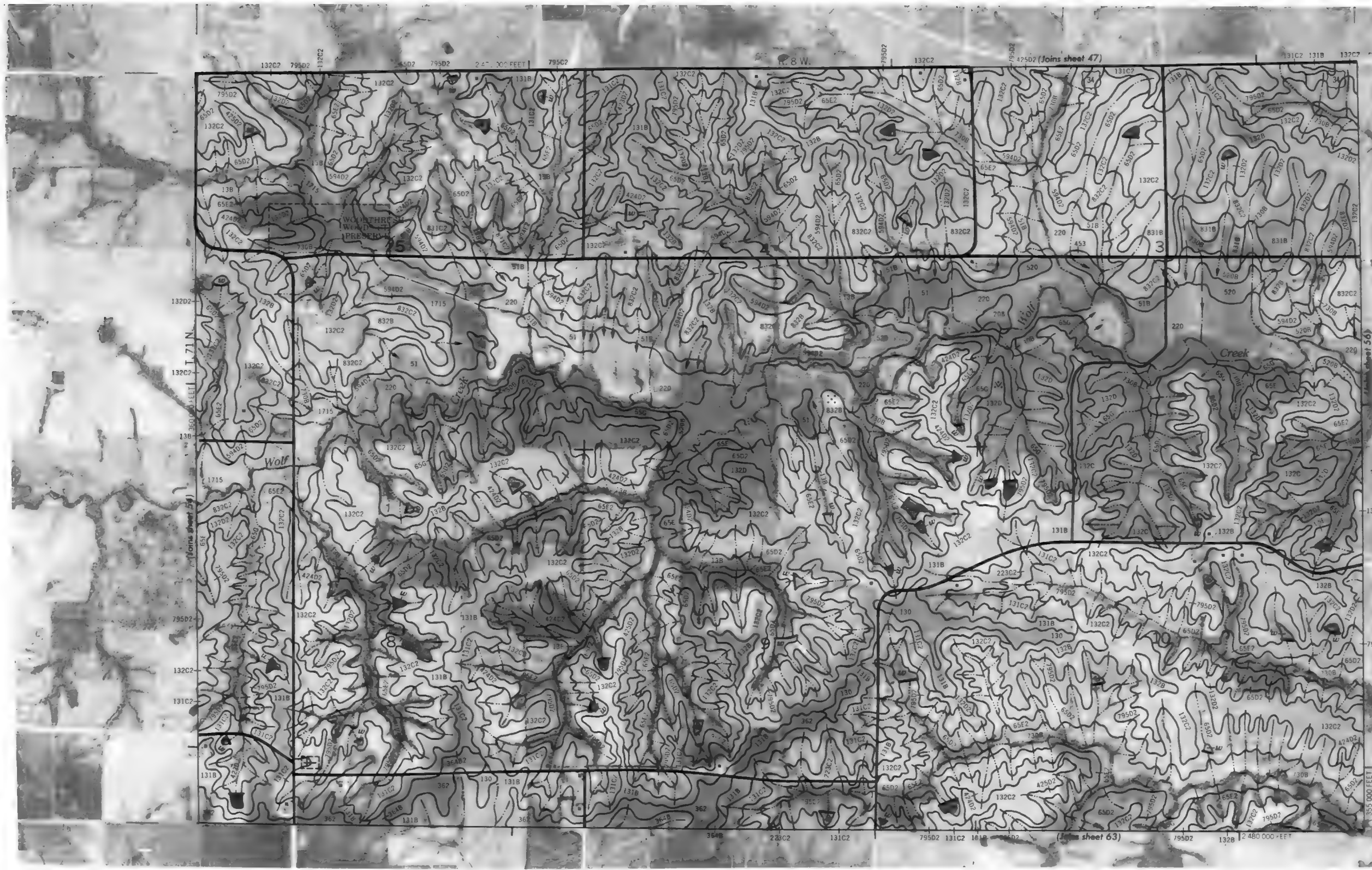
13



JEFFERSON COUNTY, IOWA NO. 54

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

JEFFERSON COUNTY, IOWA NO. 55





1 MILE

1 KILOMETER

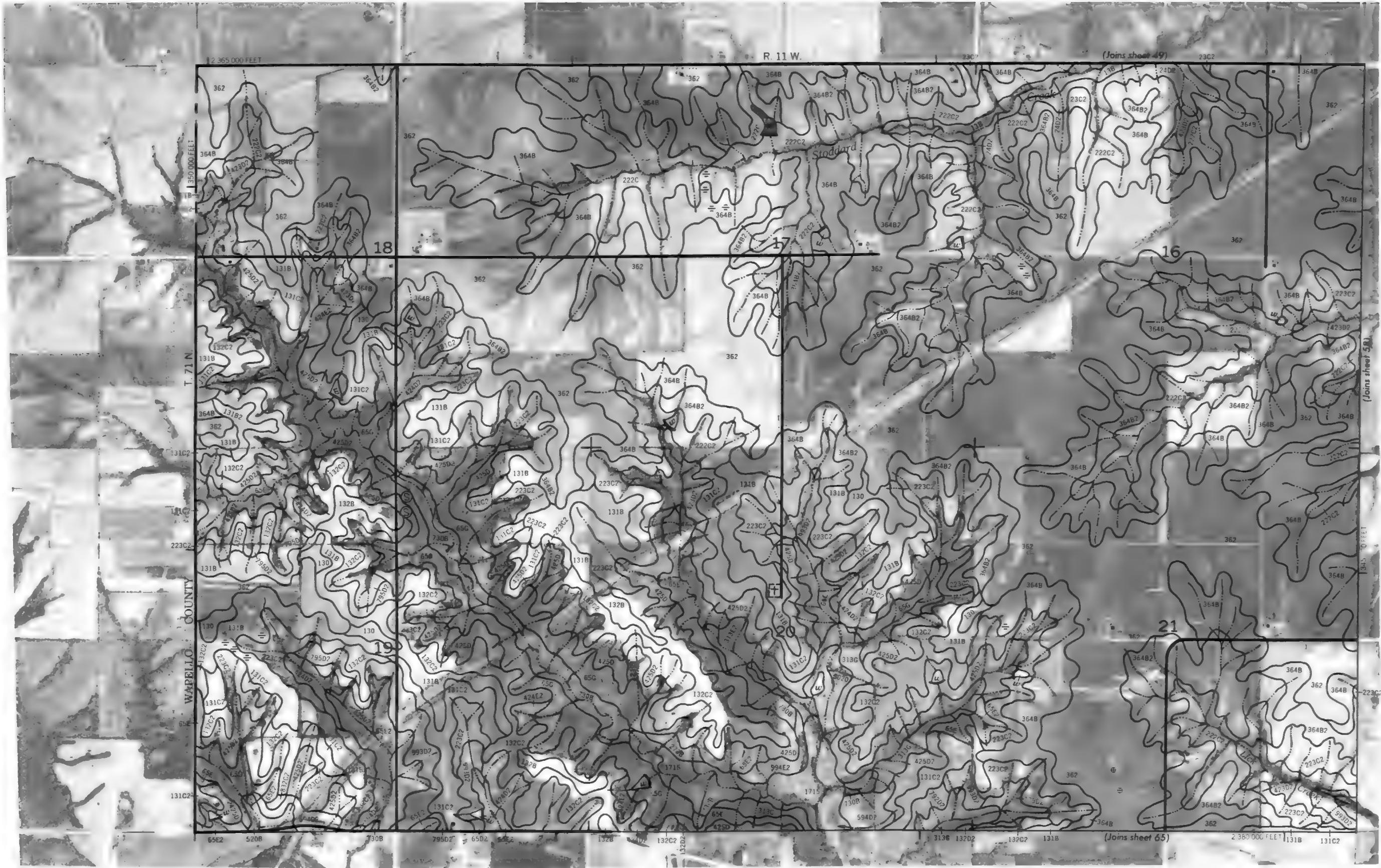
SCALE 1:15 840





This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

JEFFERSON COUNTY, IOWA NO. 57



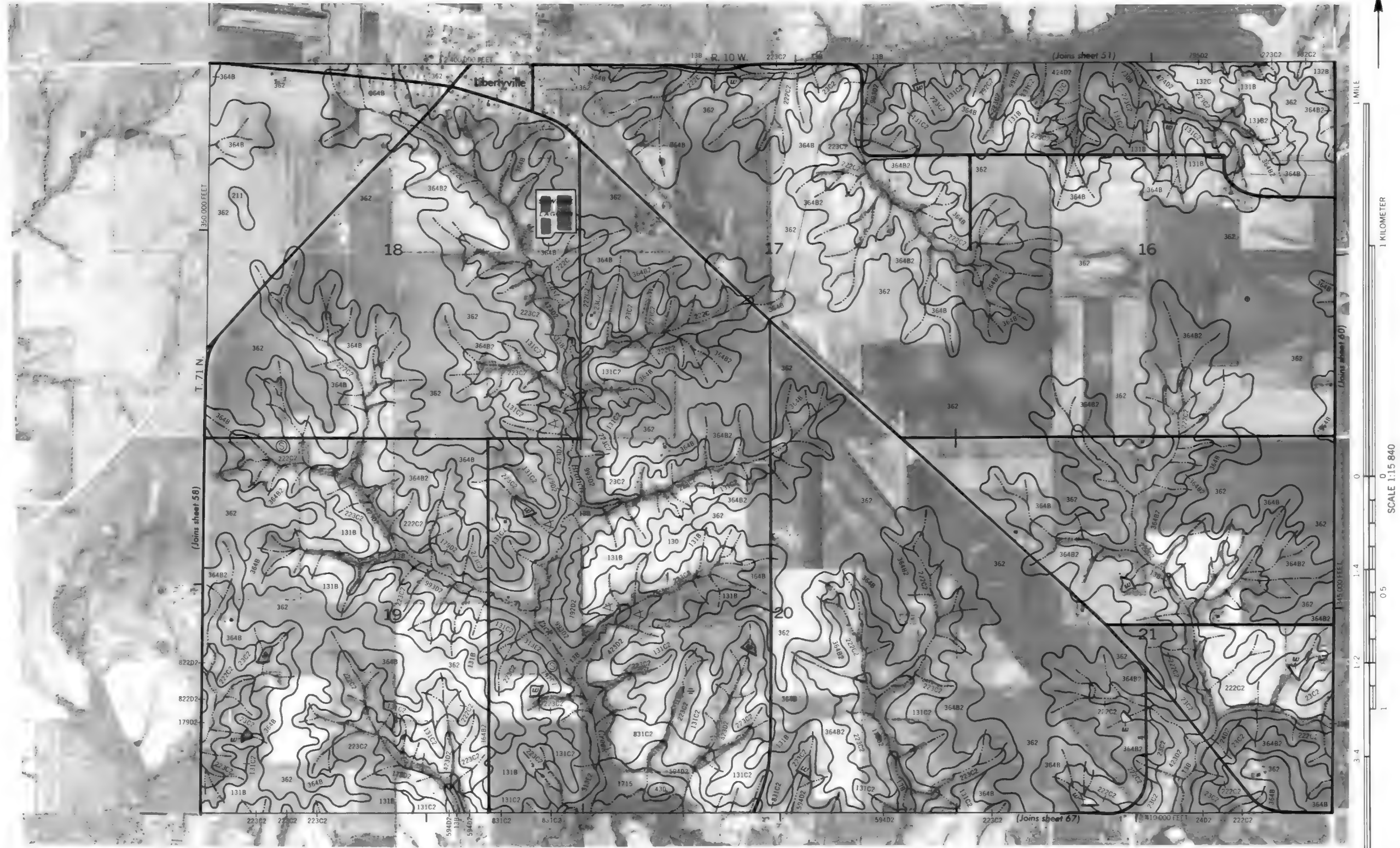
1 MILE

1 KILOMETER

SCALE 1:15,840

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

JEFFERSON COUNTY, IOWA NO. 59

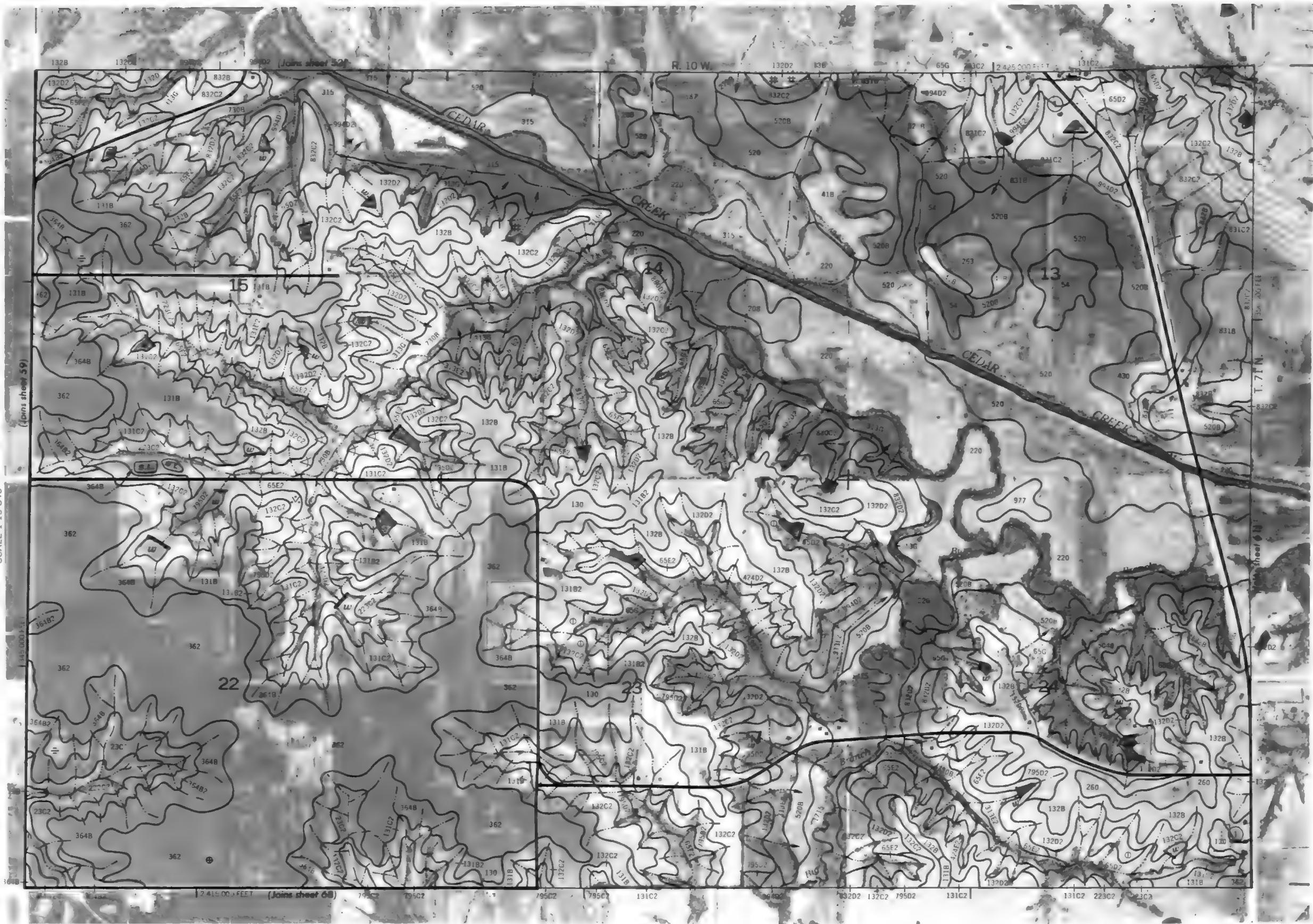
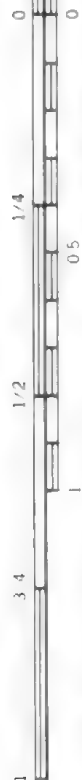




1 MILE

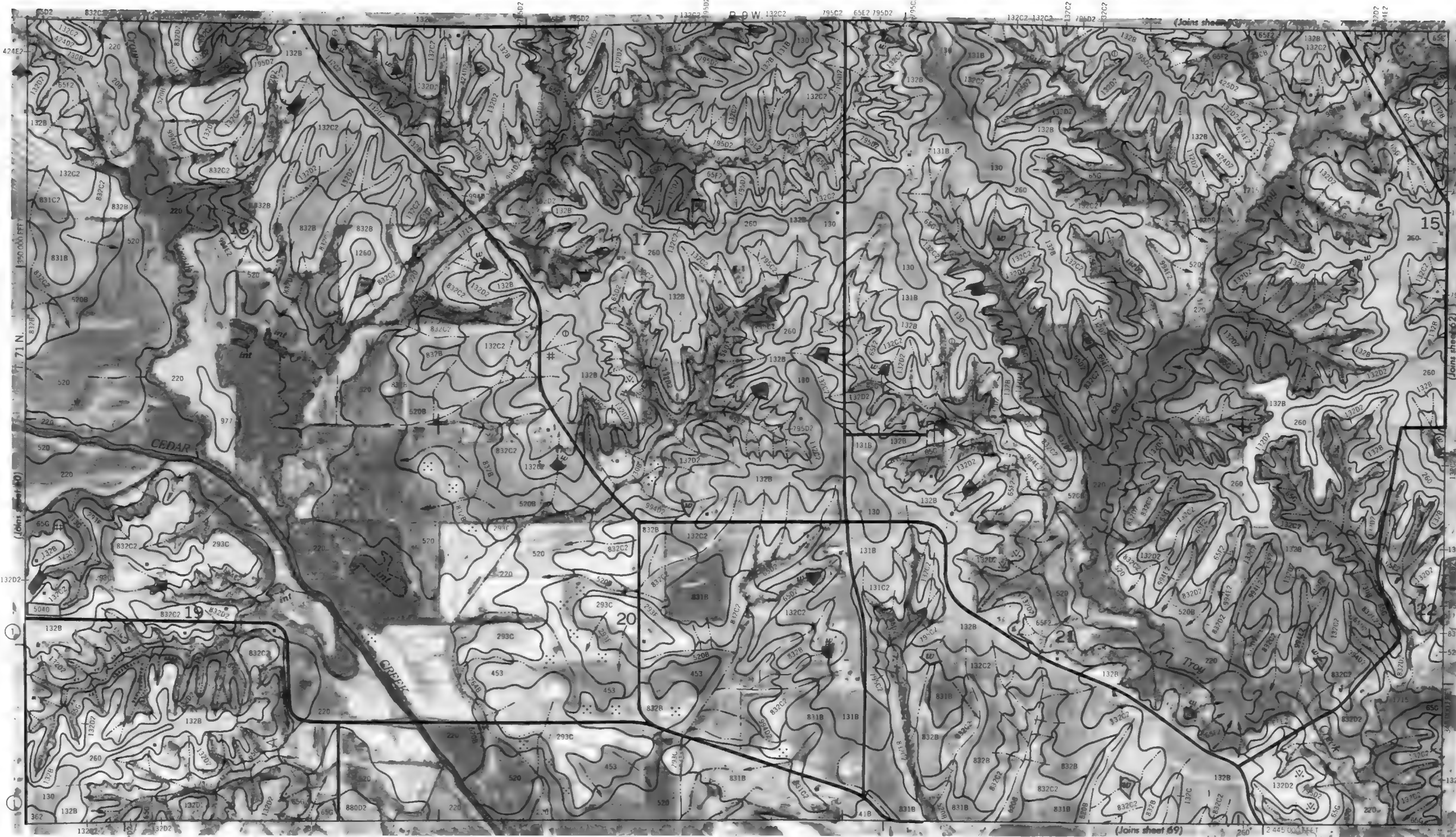
1 KILOMETER

SCALE 1:15,840



This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

JEFFERSON COUNTY, IOWA NO. 61





This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

JEFFERSON COUNTY, IOWA NO. 63

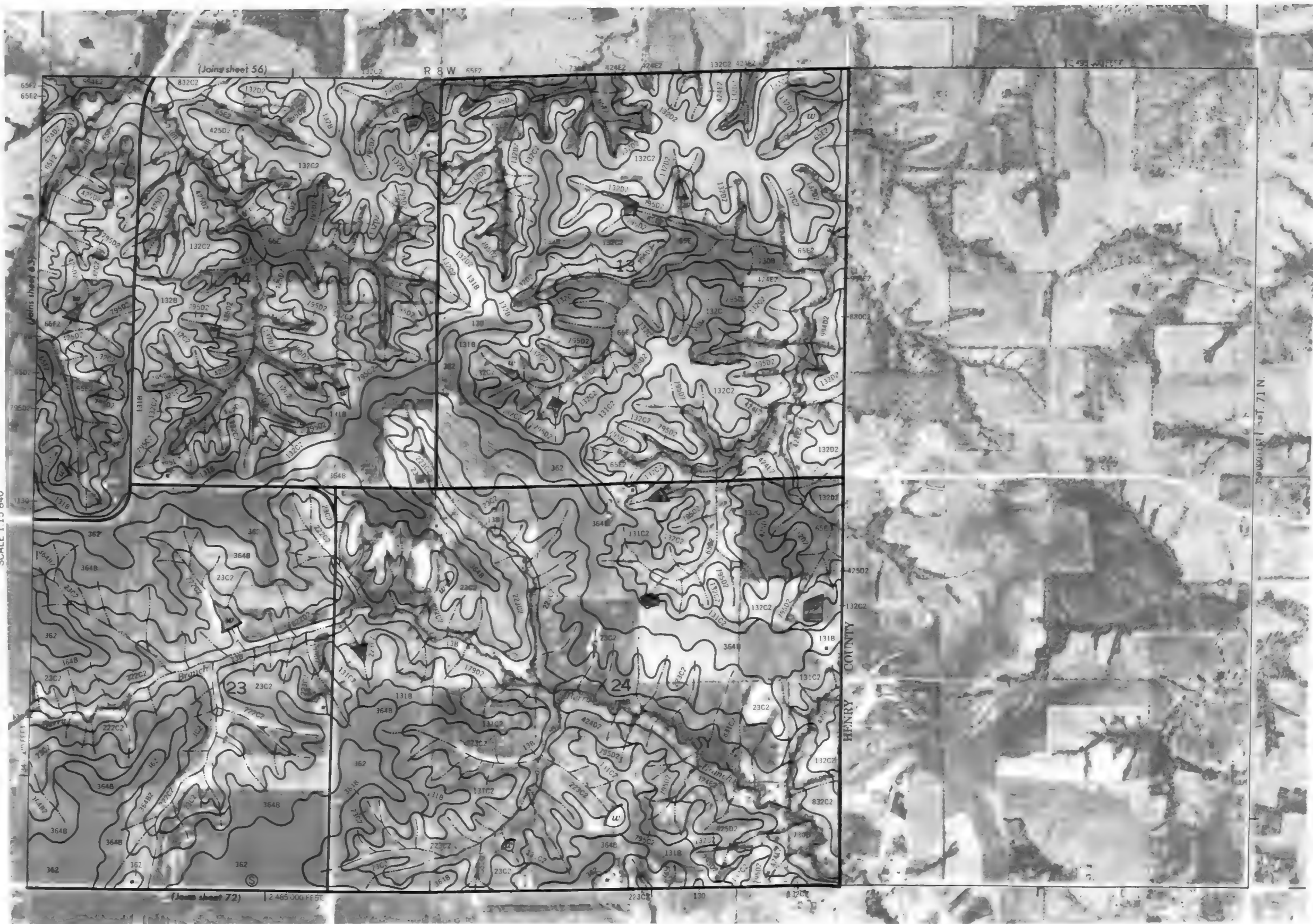
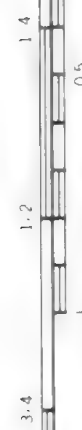




1 MILE

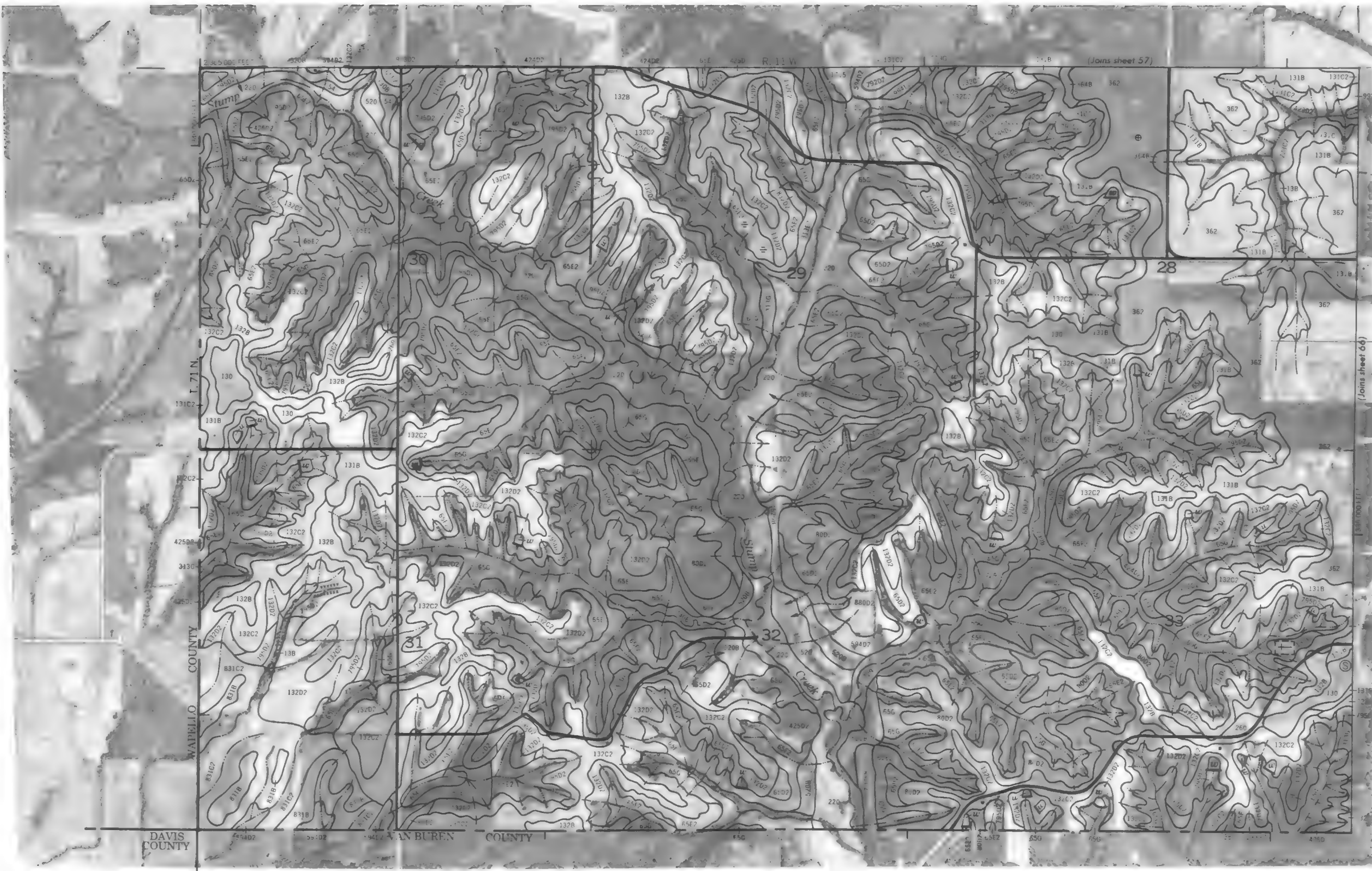
1 KILOMETER

SCALE 1:15 840





This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1933-1938 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

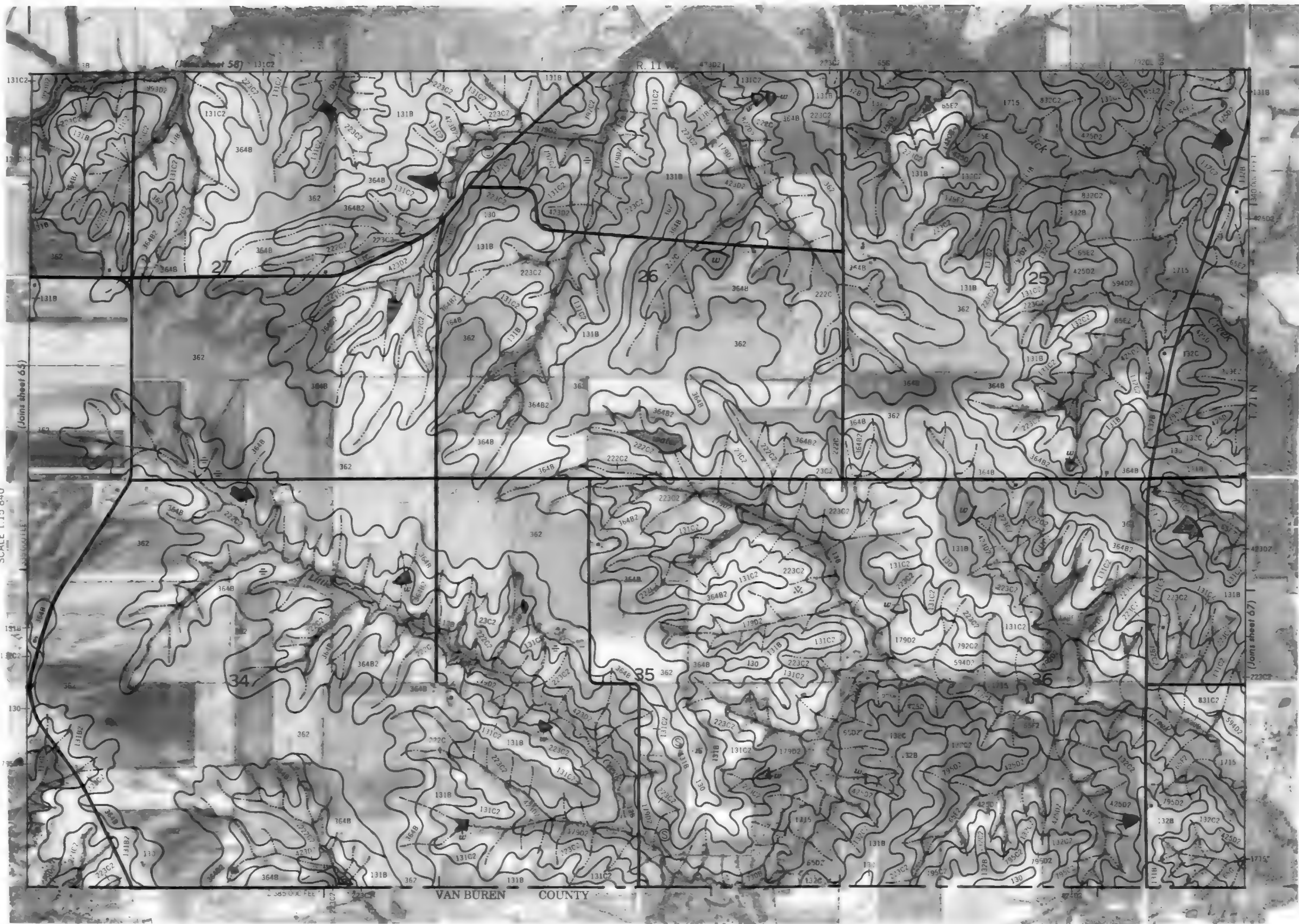
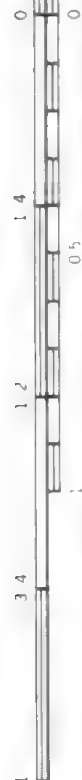




1 MILE

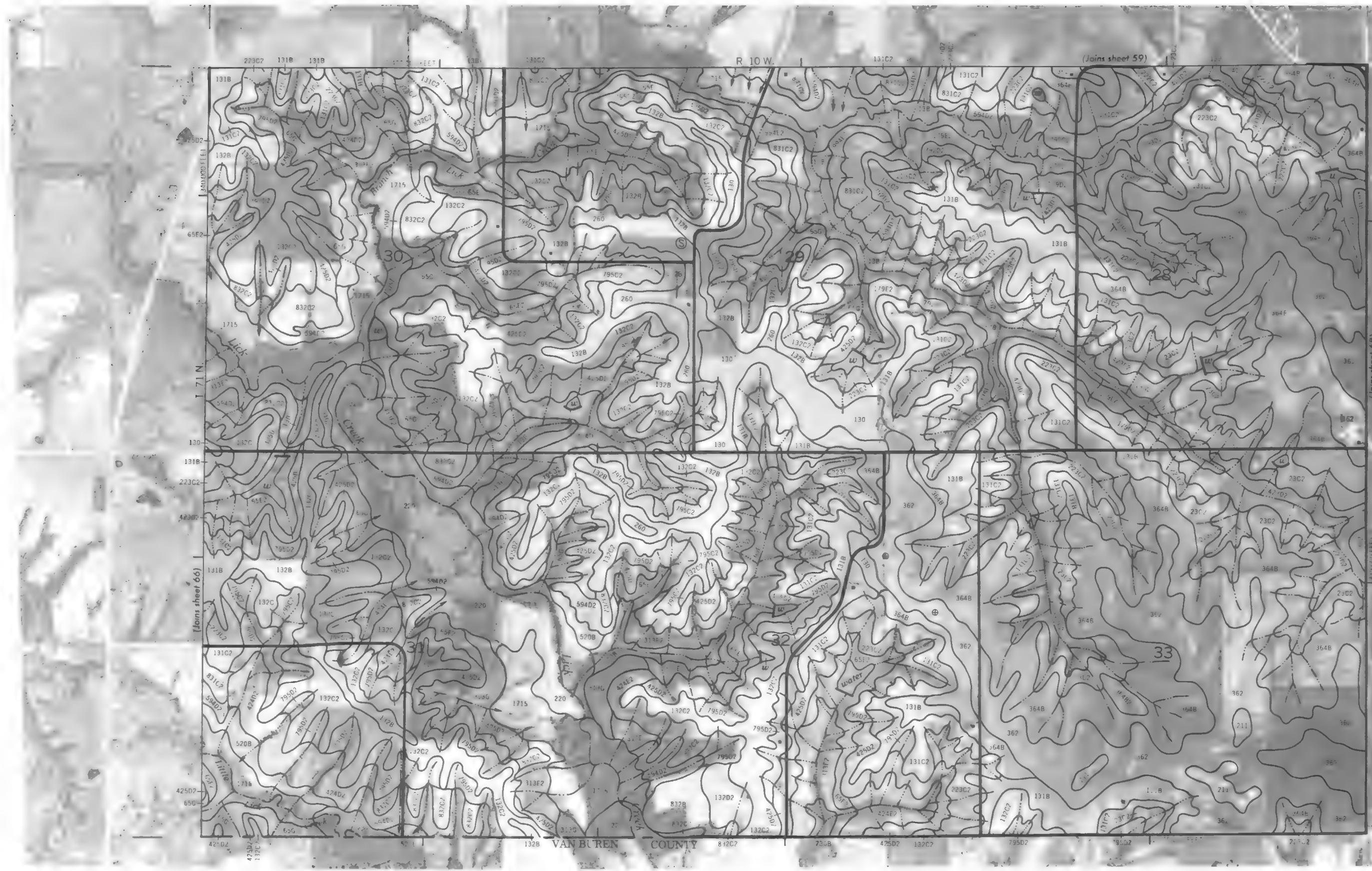
1 KILOMETER

SCALE 1:15 840



1

JEFFERSON COUNTY, IOWA NO. 67





This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned

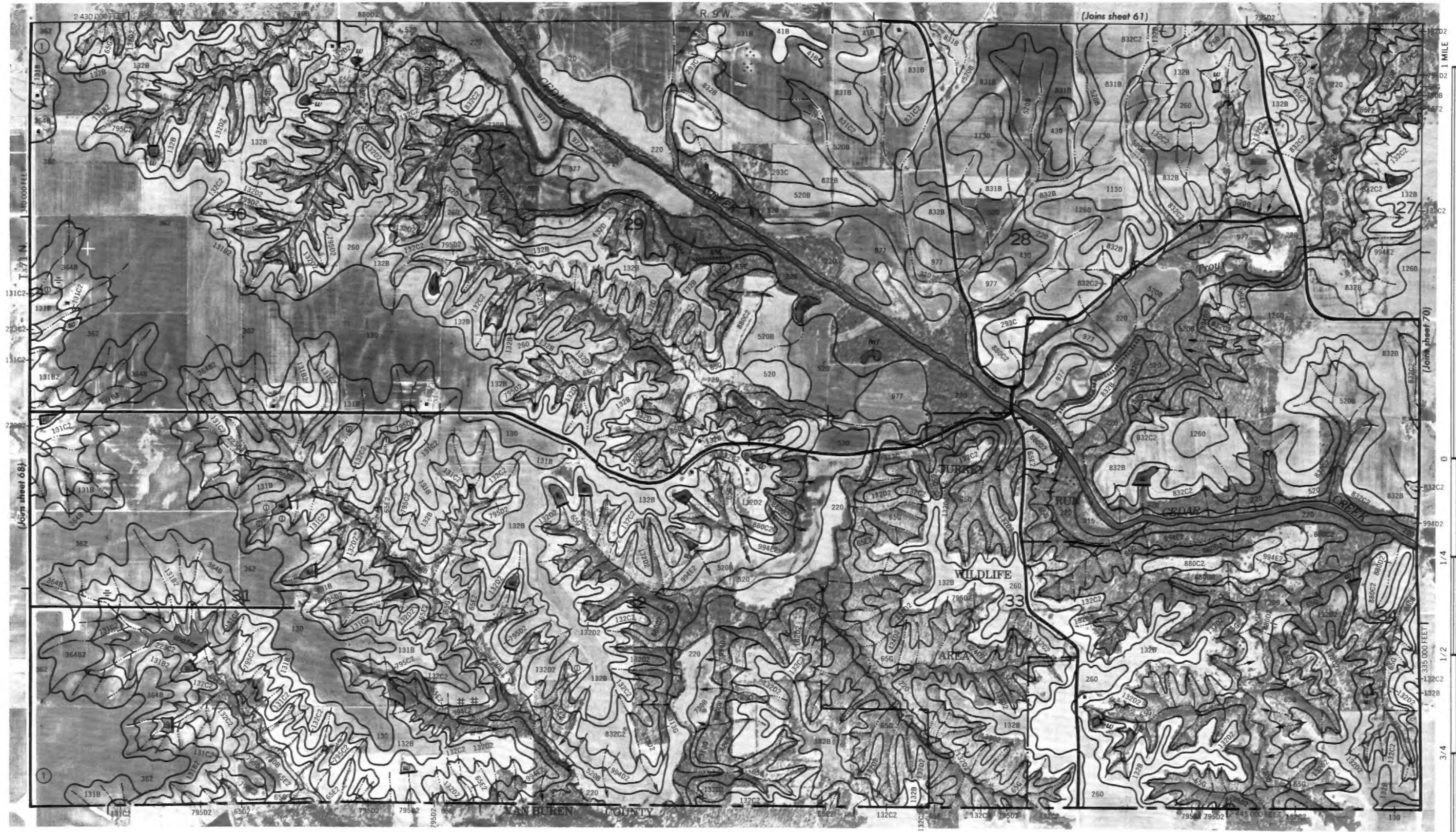


1 KILOMETER

SCALE 1:15 840

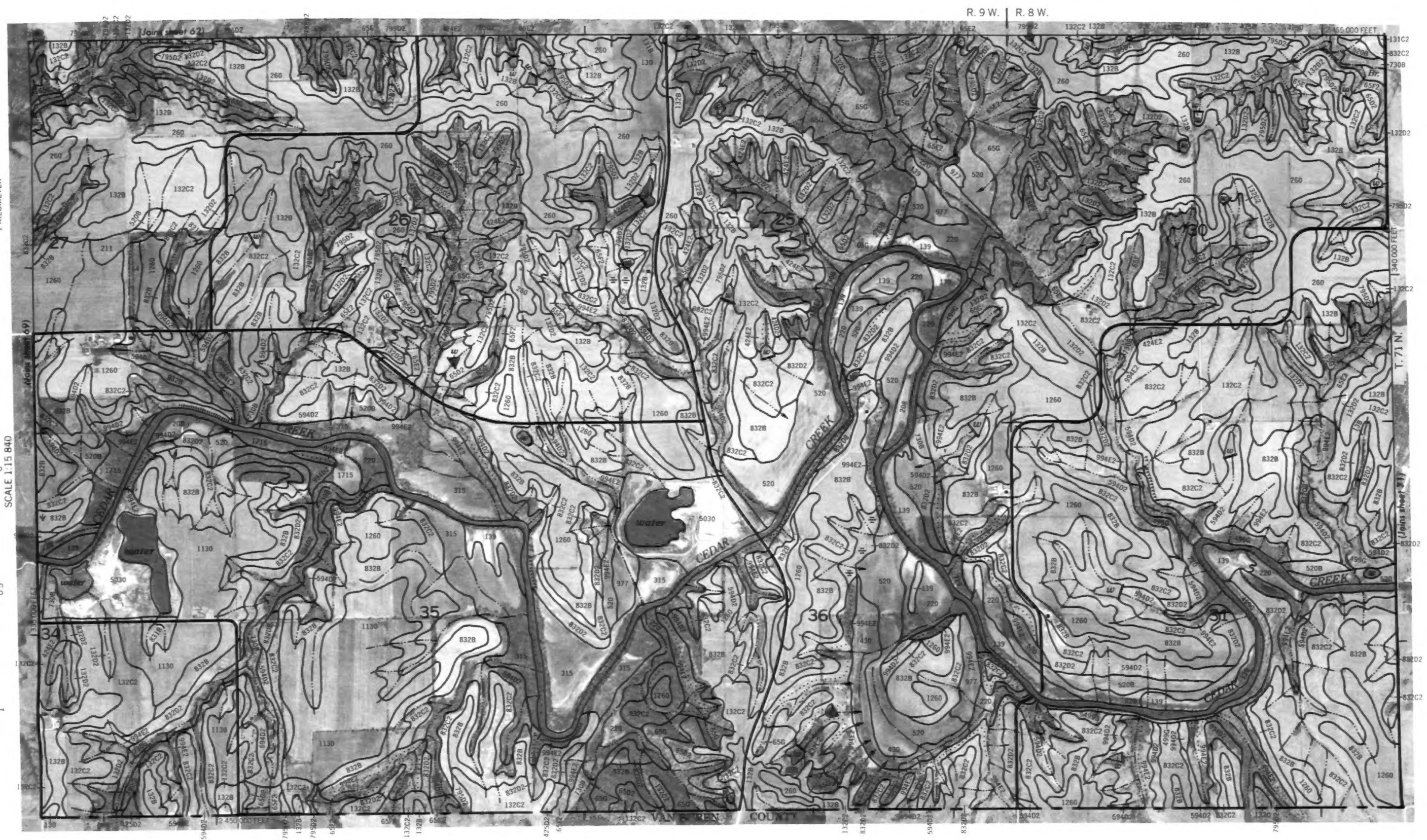
0 0.5 1 1 1/2 1/4 1/2 3/4

335 000 FEET



JEFFERSON COUNTY, IOWA NO. 69

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.





1 MILE

1 KILOMETER

SCALE 1:15 840

0 1/4 1/2 1

3/4

1

(Joins sheet 72)

(Joins sheet 63)

R. 8 W.

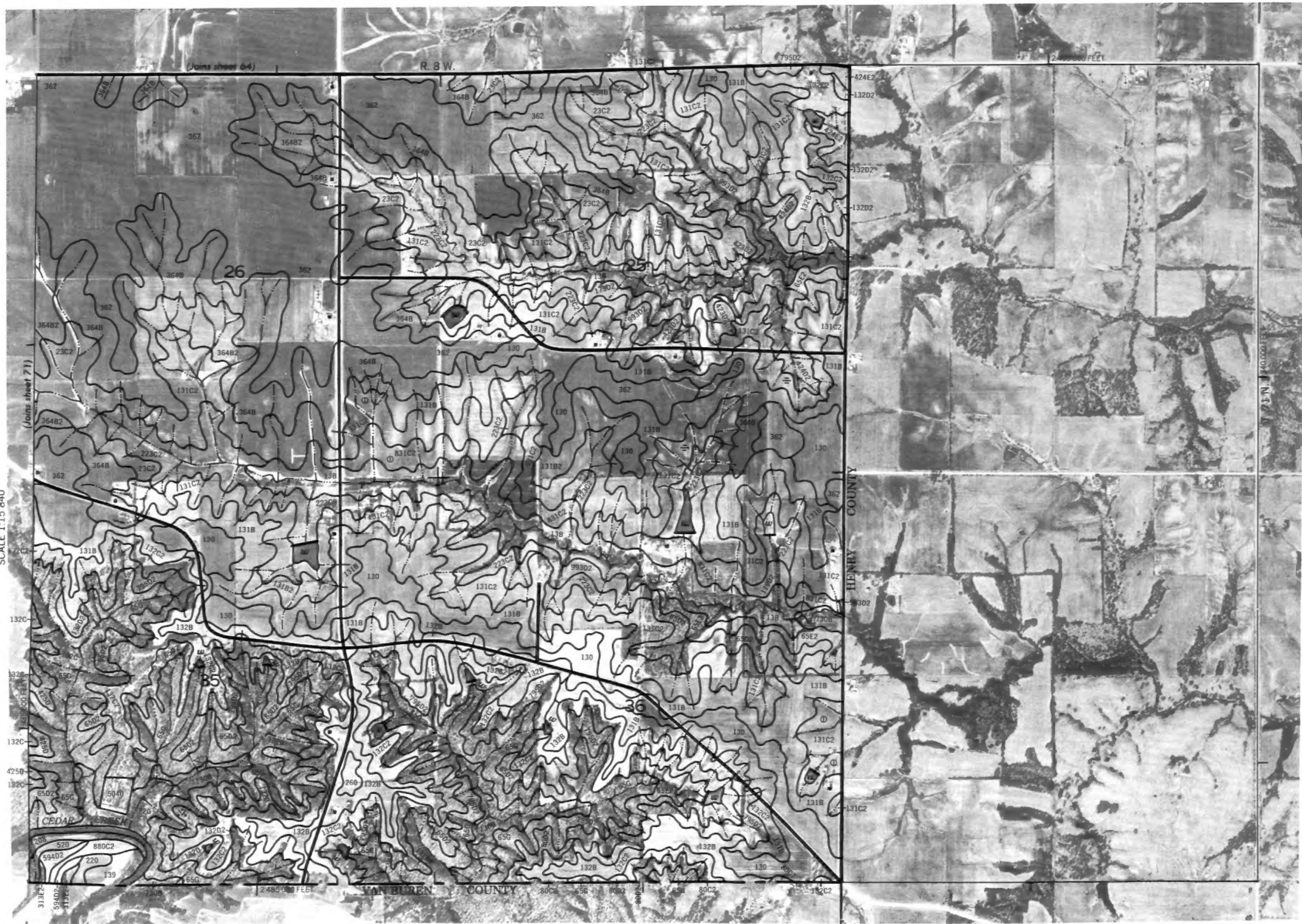
2 470 000 FEET

2 480 000 FEET

VAN BUREN COUNTY

JEFFERSON COUNTY, IOWA NO. 71





This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are from 1983 — 1984 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned